IVER 132kV GSP STRATEGIC DEVELOPMENT PLAN

Our network serving communities across Windsor and Slough

05/2025

Scottish & Southern Electricity Networks

CONTENTS

1. EXECUTIVE SUMMARY

SSEN is taking a strategic approach in the development of its distribution networks. This will help to enable the net zero transition at a local level to the homes, businesses, and communities we serve. Our Strategic Development Plans (SDPs) take the feedback we have received from stakeholders on their future energy needs to 2050 and translate these requirements into strategic spatial plans of the future distribution network needs. This helps us transparently present our future conceptual plans and facilitate discussion with local authorities and other stakeholders. The overall methodology and how it fits into our wider strategic planning process is presented in the [Strategic Development Plan methodology](#).

The focus area of this SDP is that supplied by Iver 132kV Grid Supply Point (GSP), covering Slough and parts of Buckinghamshire, Windsor and Maidenhead, and Hillingdon.

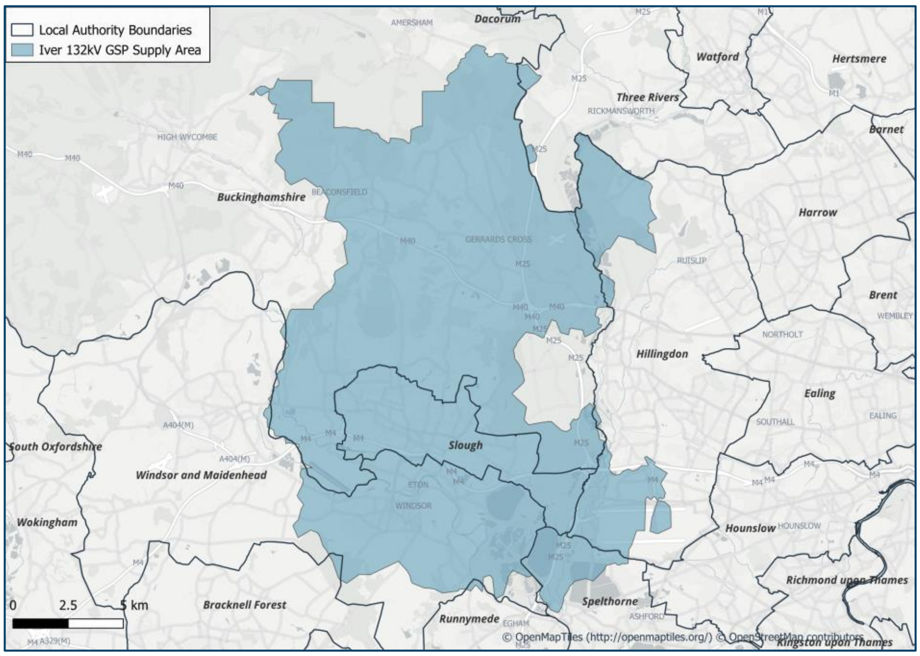

Figure 1 Geographic area covered by this report.

This report documents the stakeholder led plans that are driving net zero and growth in the local area, the resulting electricity demands, and the network needs arising from this. Plans across Buckinghamshire, Windsor and Maidenhead, and Hillingdon have been considered in preparation of this plan. Some reinforcement work has been triggered in this area through the Distribution Network Options Assessment (DNOA) process.

This SDP utilises the Distribution Future Energy Scenarios (DFES) to understand the pathway to a 2050 network that can support net zero and growth in the local economy. Recommendations from this report outline the initial steps that we believe should be taken on that pathway to develop the network in an efficient and stakeholder led way.

2. INTRODUCTION

The aim of this report is to demonstrate how local, regional, and national targets link with other stakeholder views in the area to provide a robust evidence base for load growth out to 2050 across the Iver 132kV Grid Supply Point (GSP) area. A GSP is an interface point with the national transmission system where SSEN then take power to local homes and businesses within a geographic area. Context for the area this represents is shown above in Figure 1. This report was produced in alignment with SSEN's Strategic Development Plan methodology.[1] The methodology report outlines the process that we follow in the rollout of our Strategic Development Plans and should be referred to alongside this report.

To identify the future requirements of the electricity network, SSEN commission Regen to produce the annual Distribution Future Energy Scenarios (DFES). The DFES analysis is based on the National Energy System Operator (NESO) Future Energy Scenarios (FES) while accounting for more granular stakeholder insights from agencies such as local authorities and new demand and generation connection applications. The DFES provides a forward-looking view of how demand and generation may evolve under four different scenarios as we move towards the national 2050 net zero target. Due to the timing of when this report was produced, this SDP has been informed by the analysis undertaken as part of the DFES 2023. DFES 2023 consists for four different scenarios which are summarised in **Error! Reference source not found.**2. SSEN currently use Consumer Transformation as the central case scenario following stakeholder feedback during the RIIO-ED2 development process. This position is reviewed annually. The 2024 DFES outlines three new pathways (Holistic Transition, Electric Engagement, and Hydrogen Evolution) that achieve net zero by 2050 against a Counterfactual and further detail on DFES 2024 can be found in Appendix A and in the DFES 2024 reports.

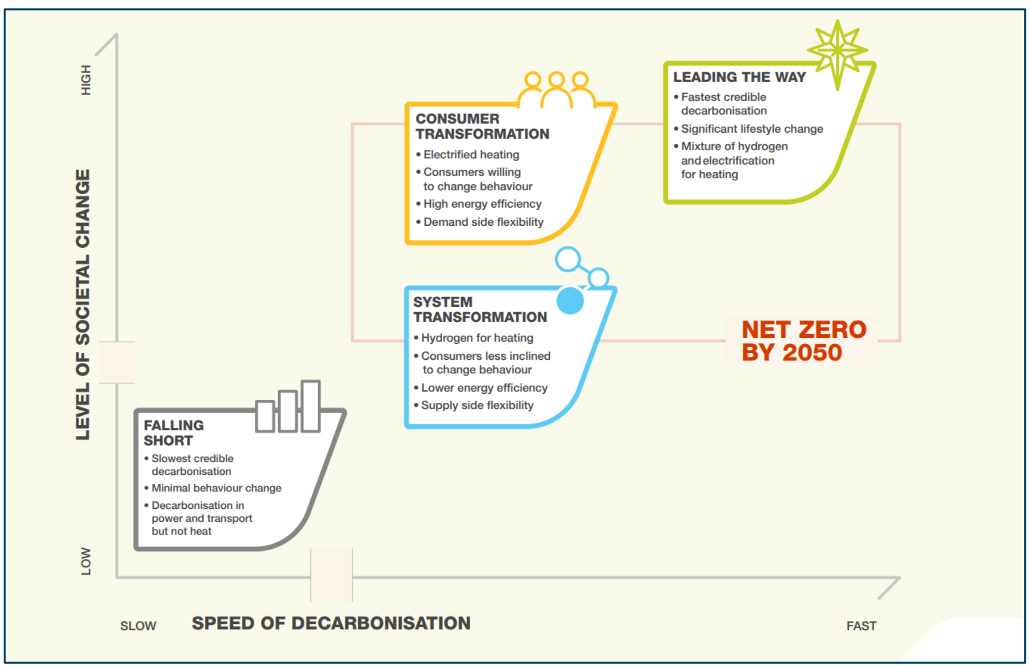

Figure 2 DFES 2023 Scenarios

1 Strategic Development Plan Methodology - January 2025

Using the DFES, power system analysis has been carried out to identify the future system needs of the electricity network. These needs are summarized by highlighting the year the need is identified under each of the four scenarios, and the projected 2050 load. Here, system needs are identified through power system analysis using the DFES 2023 Consumer Transformation scenario in alignment with evidence gathered in preparation of the SSEN ED2 business plan. We also model across the other three scenarios to understand when these needs arise and what demand projections should be planned for in the event each of these scenarios is realised.
The DNOA process will provide more detailed optioneering for each of these reinforcements, improving stakeholder visibility of the strategic planning process. Opportunities for procurement of flexibility will also be highlighted in the DNOA, to cultivate the flexibility markets, and to align with SSEN’s flexibility strategy.

3. STAKEHOLDER ENGAGEMENT AND WHOLE SYSTEM CONSIDERATIONS

3.1. Local Authorities and Local Area Energy Planning

The main local authorities that are supplied by Iver 132kV GSP are Buckinghamshire, Slough, Hillingdon, Spelthorne, Surrey County, and Windsor and Maidenhead, as shown in Figure 3. The development plans for these local authorities will have a significant impact on the potential future electricity load growth on SSEN's distribution network. As such, it is vital for SSEN to engage with these plans when carrying out strategic network investment.

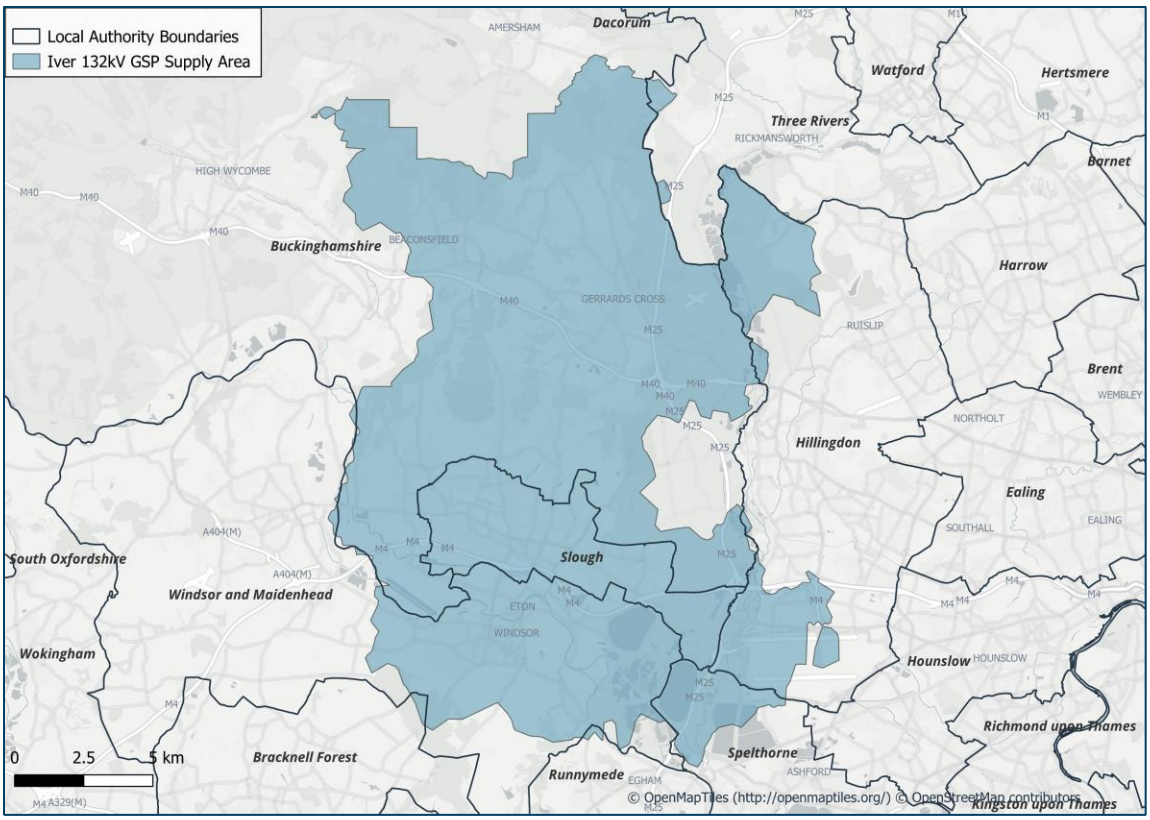

Figure 3 Area of focus for this SDP

3.1.1. Buckinghamshire Council

Buckinghamshire Council has seen population growth of 9.5% from around 505,300 in 2011 to around 553,100 in 2021[2]. The Council was formed in 2020, combining the four local councils of Aylesbury Vale, Chiltern, Wycombe, and South Bucks. It is currently developing its first Local Plan and has produced the Council's Climate Change and Air Quality Strategy, which aims to reduce 75% of council emissions by 2030 and meet the

2 Census 2021, January 2023, How life has changed in Buckinghamshire: Census 2021.

national net zero target by 2050 as a minimum with ambitions to reach this target earlier[3]. In March 2024, the council was successful in securing £1.9 million of government LEVI funding to install hundreds of publicly accessible EV chargers[4], supporting its target of 1000 EV chargers by 2027. The council has also started a new home energy efficiency grant scheme for grants up to £30,000 to be used for energy efficiency improvements in home across the county[5], making these houses more suitable for the installation of heat pumps. Furthermore, in April 2024, the council released their Housing Strategy for 2024 to 2029[6], where energy efficiency is placed front and centre.

3.1.2. Slough Council

Slough Borough Council have committed to becoming carbon neutral by 2040, with 2030 as a stretch target. This is supported by the Climate Change Strategy and Action Plan. The Council is scoping opportunities for transitioning from gas to low carbon heating systems through both heat networks and heat pumps.

The Council has recently adopted an Electric Vehicle Charging Infrastructure Strategy, and is decarbonizing its vehicle fleet and organizing electric vehicle funding schemes for lower income communities.

3.1.3. Windsor and Maidenhead Council

Royal Borough of Windsor and Maidenhead Council have committed to reach net zero by 2050 and have an Environment and Climate Strategy to support this, which includes incremental targets in preceding years. This is supported by a target to increase renewable generation ten-fold by 2025 from 2019 figures. Solar PV and heat pumps have been installed on council-owned properties, and they have organized a group purchasing scheme for solar PV, Solar Together.

The Council has an Electric Vehicle Chargepoint Implementation Plan which was published in February 2023. They aim to have electric vehicle chargepoints in all council car parks by 2028 and by 2035, 70% of homes without driveways are within a 5-minute walk of a public chargepoint.

3.1.4. Spelthorne Council

Spelthorne Borough Council targets to reach net zero in its scope 1 and 2 emissions by 2030. As detailed in their Local Plan, Runnymede Borough Council aims to build over 7,500 new homes by 2030 and requires new developments of a certain size to generate a percentage of their demand from renewable sources. Surrey County Council states in its Climate Change Strategy that it aims for all twelve member local authorities to:

- Reach net zero emissions no later than 2050;
- Supply 15% of electricity demand from solar PV by 2032; and
- Have half of all vehicles electric by 2025.

3 Climate Change and Air Quality Strategy | Buckinghamshire Council

4 Buckinghamshire Council seeks nominations on new EV charging point locations | Buckinghamshire Council

5 New home energy efficiency grant scheme launches in Bucks | Buckinghamshire Council

6 Council unveils ambitious Housing Strategy for 2024 to 2029 | Buckinghamshire Council

3.1.5. Hillingdon Council

Hillingdon's population increased by 11.7% to approximately 305,900 residents within the 10 years to 2021.[7] The borough has metropolitan and district centres at Uxbridge, West Drayton, and Hayes. Heathrow Airport comprises substantial land area in the southern region of the borough, and there are ongoing plans under discussion to expand airport capacity through addition of a third runway to the northwest of the current footprint, along with other works such as enhanced public transport links and an additional terminal.[8] The Council has also committed to its own operations reaching carbon neutrality by 2030.[9]

3.1.6. Surrey County Council

Surrey County Council aims for the county to reach net zero by 2050. In support of this, they have a Climate Change Strategy and have set a target for 15% of countywide energy needs to be met from solar PV by 2032 and to develop local smart energy systems to facilitate this. The Council is aiming for 2 heat networks within the county and are interested in a hydrogen refueling pilot.

The Council was recently accepted onto the LARA (Local Area Retrofit Accelerator) programme to create a bespoke retrofit strategy for the county.

3.2. Whole System Considerations

3.2.1. Specific whole system considerations

Iver 132kV GSP is one of the points of connection for Heathrow airport. Slough trading estate, Europe's largest trading estate, also has two large points of connection to our substations in Slough which have many large data centre connections. Due to the economic significance of these large entities, a deeper understanding of their future and electricity needs should be investigated further to ensure that SSEN can facilitate their requirements when needed.

3.2.2. West London Capacity Constraints

The west London electricity capacity constraints are well known and understood. Over the past few years, there has been a steep increase in the number of new electricity connection requests across west London, driven by new housing developments, commercial investment and datacentres. In response, we have led collaboration with NGET, NESO, and UKPN and key stakeholder the Greater London Authority (GLA) – supported by Ofgem – that has aimed to provide solutions to the constraints highlighted above. SSEN has provided some immediate solutions in West London.[10]

This has enabled, 16,944 new homes permitted to be unlocked through GLA support and introduction of the 1MVA ramping solution (as of February 2025). This also includes how flexibility services can be deployed to help accelerate connections.

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7 Hillingdon Council, January 2021, How life has changed in Hillingdon: Census 2021.

8 Expansion | Heathrow

9 Hillingdon Council, July 2021, Strategic Climate Action Plan.

10 West London electricity capacity constraints, GLA: West London electricity capacity constraints | London City Hall

3.2.3. Transmission interactions

At present we are working closely with NGET at Iver 132kV GSP to deliver infrastructure upgrades. Additionally, we are currently working with NGET to identify a potential new GSP in the geographic area covered by this SDP. We will look to optimise our future plans around this potential opportunity.

In the broader Iver 132kV supplied area, National Grid Electricity Transmission (NGET) have referenced in their T3 business plan (2026-2031) that they plan to replace overhead line conductors on the Amersham – East Claydon – Iver 1 and 2, Iver - Laleham, and Iver – West Weybridge circuits[11]. NGET are also undertaking a wider strategic review of the transmission cable circuits in West London and future network requirements.

3.2.4. Flexibility Considerations

Flexibility services

SSEN procures Flexibility Services from owners, operators, or aggregators of Distributed Energy Resources (DERs) or Consumer Energy Resources (CERs), which can be generators, storage, or demand assets. These services are needed in areas of the network which have capacity constraints at particular times or under certain circumstances. SSEN purchases Flexibility Services from all types of providers (e.g. domestic or commercial). Information on the process for procurement and how to participate are published on the Flexibility Services website and information on real time decision making on which providers are dispatched can be found in the Operational Decision-Making document.[12,13]

SSEN regularly recruits new Flexibility Services providers and increases the procured Flexibility Services with the latest bidding round for long term requirements held in August 2024 and recruitment through the Mini-Competition process in October 2024.

Areas across Iver 132kV GSP where flexibility has been procured is shown below in Figure 4. This map shows all Flexibility Services procured.

11 National Grid – South East: Future Network Blueprint (https://riiot3.nationalgrid.com/document/30126/download)

12 SSEN, Flexibility Services Procurement (Flexibility Services Procurement - SSEN)

13 SSEN, 02/2024, Operational Decision Making (ODM), SSEN Operational Decision Making ODM

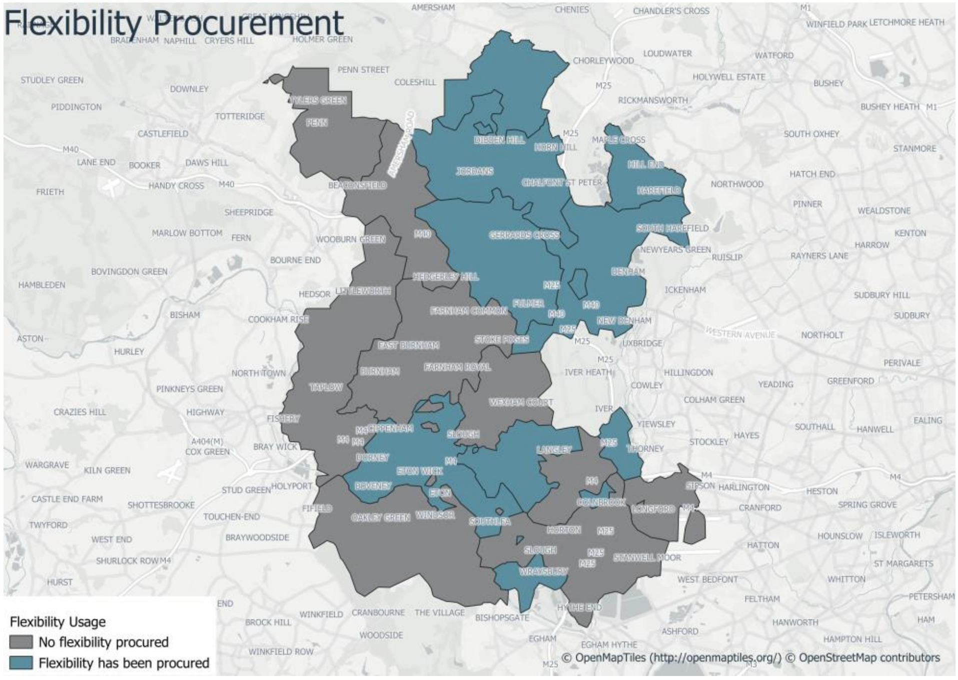


Figure 4 Flexibility procurement across Iver 132KV GSP

4. EXISTING NETWORK INFRASTRUCTURE

4.1. Iver 132kV Grid Supply Point Context

The Iver 132kV GSP network is made up of 132kV, 33kV, 22kV, 11kV, 6.6kV and LV circuits. It has both areas of urban and rural network, covering densely populated areas such as Slough and Windsor, but also a large rural area just north of Slough towards towns such as Beaconsfield. In total the GSP serves approximately 131,000 customers. Table 1 shows the values for the GSP and Bulk Supply Points (BSPs) for information on primary substations please see Appendix B. The peak maximum demand refers to the peak at each individual substation which may not be at a coincident time as the others (meaning we would not expect the values for each BSP to sum to that at the GSP).

Substation Name	Site Type	Number of Customers Served (approximate)	2023 Substation Maximum MVA (Season)
IVER 132KV	Grid Supply Point	131,000	464.42
LONGFORD	Bulk Supply Point	6,800	33.83
UPTON BSP	Bulk Supply Point	19,000	32.93
DENHAM	Bulk Supply Point	26,000	50.92
CHALVEY BSP	Bulk Supply Point	33,000	50.95
CIPPENHAM	Bulk Supply Point	17,000	34.09
SLOUGH	Bulk Supply Point	28,000	89.17

Table 1 Customer number breakdown and substation peak demand readings (2023)

4.2. Current Network Topology

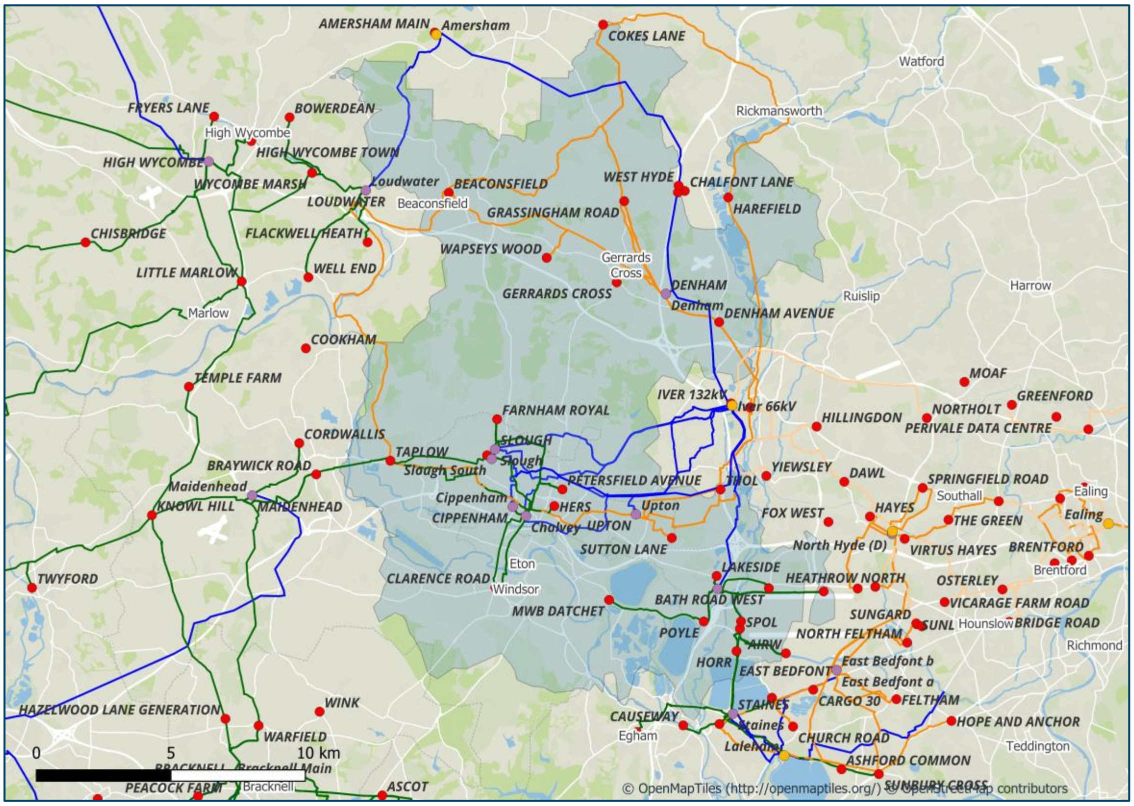


Figure 5 Iver 132kV GSP geographic view of substation locations and Extra-High Voltage Circuits

4.3. Current Network Schematic

The existing 132kV network at Iver 132kV GSP is shown below in Figure 6, network schematics for the 33kV network are shown in Appendix C.

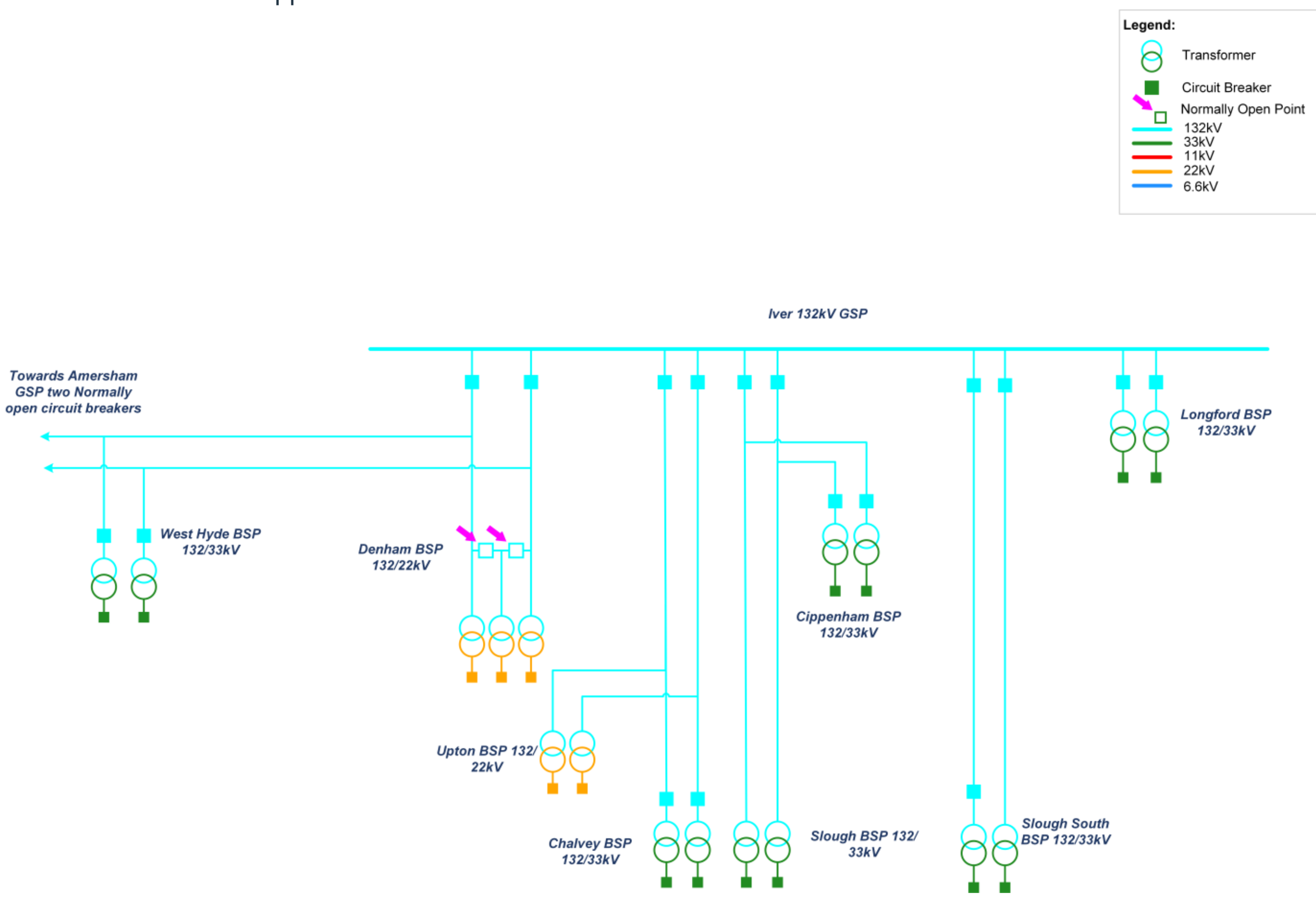


Figure 6 Iver 132kV Present network

5. FUTURE ELECTRICITY LOAD AT IVER 132KV GSP

The following section details load growth across the technologies projected in the Distribution Future Energy Scenarios 2023[14]. There are important notes on the values presented here:

- The load growth described in this section is based upon DFES 2023 to align with the DFES data used to analyse network needs in this report. DFES 2024 insights are now available and can be found in Appendix A
- These projections relate to the GSP supply area highlighted in Figure 3 and are not directly aligned to a particular local authority.
- Where MW values are presented in this section, they represent total installed capacity. When conducting network studies these values are appropriately diversified to estimate the coincident maximum demand of the entire system rather than the total sum of all demands. This accounts for the fact that not all demand load connected to the network peaks at the same time.

For future iterations of the DFES, additional work has been carried out to ensure that the demand projections are rationalised against any developing LAEPs across the Iver 132kV GSP area.

5.1. Distributed Energy Resource

5.1.1. DFES Projections

Generation

Due to the mix of densely built up areas of west London and Slough which Iver 132kV supplies, we would not expect to see a significant number of large-scale generation sites.

The DFES projections show the majority of generation in the area coming from energy from waste and solar PV, with solar, likely to come from rooftop solar, growing into the future and energy from waste growing out to 2035 and then shrinking again as we move towards 2050.

14 SSEN Distribution Future Energy Scenarios 2023

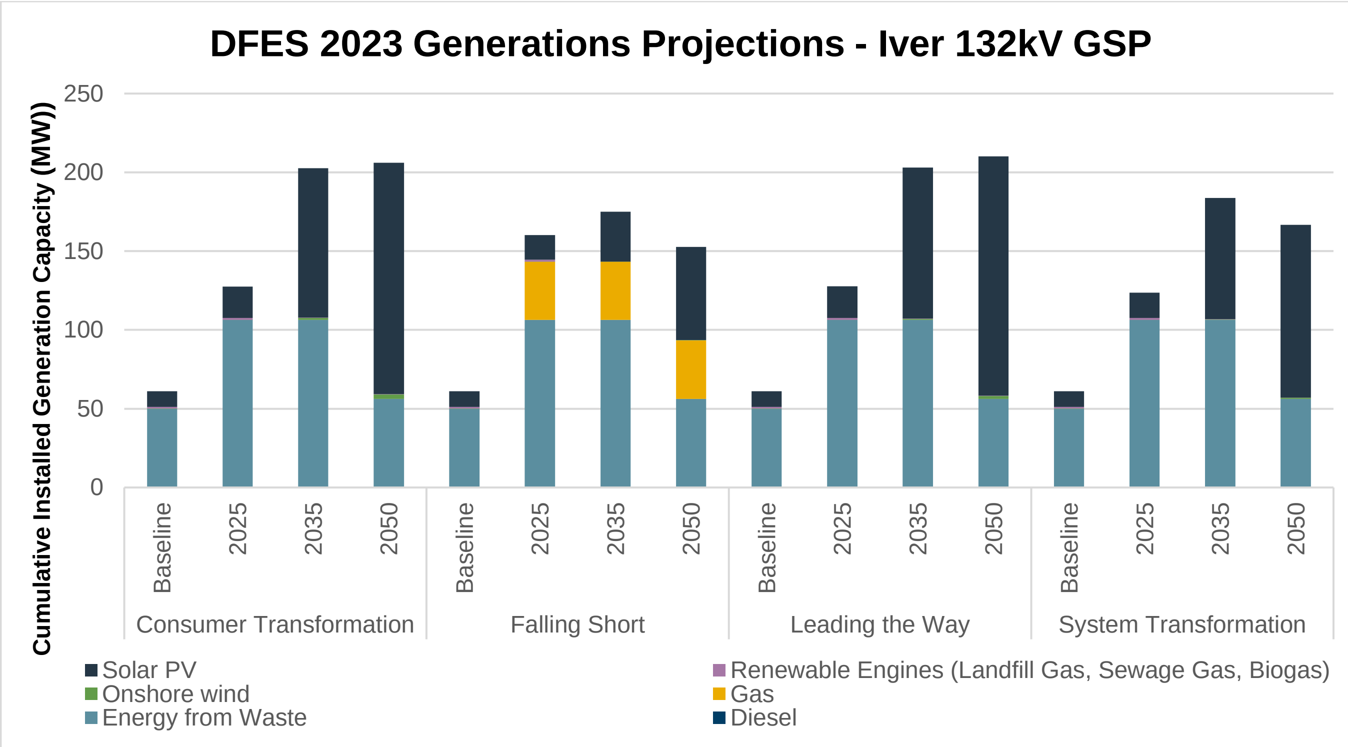


Figure 7 DFES 2023 Generations Projections - Iver 132kV GSP

Storage

There have been many applications for large storage projects within the Iver 132kV supply area, the contracted connections are covered as standalone-grid services shown in the table below. The future growth of storage is coming from domestic customers installing battery storage at their own properties. For the amount of solar generation predicted there is also a relatively small amount of co-located storage forecast to connect to the network.

5.2. Transport Electrification

A key consideration for demand growth across west London and Slough is the shift to more electrified transport. The DFES mostly focused on decarbonisation of road transport with aviation and rail not included in any of the ENA agreed technology building blocks. Iver 132kV GSP supplies some of Heathrow airport as well as having a supply to Network Rail, it is important to consider how further electrification of different transport vectors may impact the electricity network further than the DFES introduced here.

5.2.1. DFES Projections

Under the Consumer Transformation scenario, 344,714 electric vehicles are projected to be located across the Iver 132kV GSP supply area by 2050. It is important to understand the network facing demand arising from these vehicles, so the DFES projects the number of domestic off-street chargers and the total installed capacity of other EV charger types. By 2050 the Consumer Transformation scenario projects 79,184 domestic off-street chargers. The breakdown of installed capacity for other charger types is shown in the figure below.

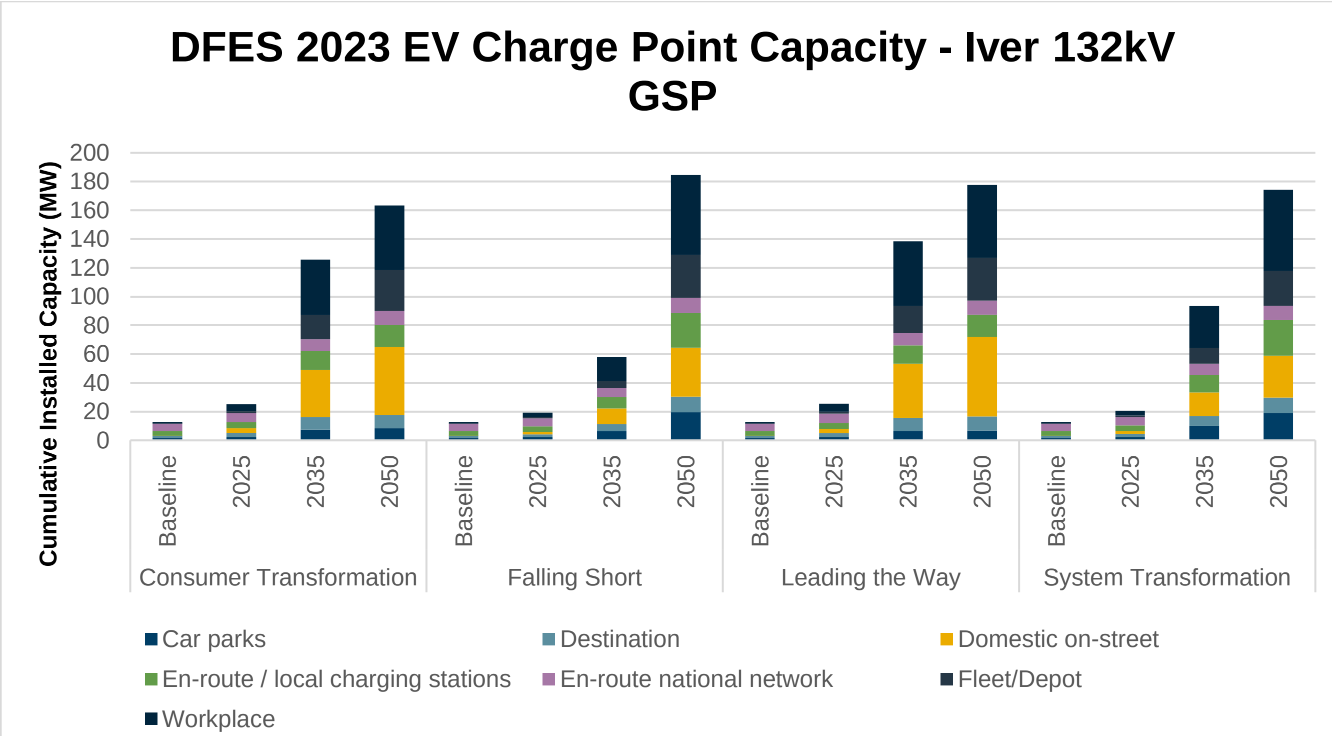


Figure 8 Projected EV charge point capacity across Iver 132kV GSP. *Source: SSEN DFES 2023*

5.3. Electrification of heat

The pathway to heat decarbonisation is more uncertain, and as a result we currently see a wide range of credible scenarios. Following the decision by DESNZ on the role of hydrogen for heating in 2026, there will be a clearer view of the impact of heating on the electricity network.[15] This decision will help both electricity and gas networks better understand future requirements, and plan to these accordingly. Further to this, engagement has made it clear to us that there are aspirations for the development of heat networks across the west London area. Viable sites have been identified through the West London Local Area Energy Plan (LAEP) and are emerging through the Department for Energy Security and Net Zero (DESNZ) national heat network zoning. Currently, the presence of heat networks is considered through the DFES analysis using heat network project pipelines[16] in the near term and DESNZ opportunity areas for district heating networks in the longer term.[17] This is aligned to targets for heat networks to serve 20% of domestic heating by 2050. The impact this has on DFES projections is a decrease in the number of standalone heat pumps projected in areas where there is likely going to be development of heat networks.

5.3.1. DFES Projections

Under the Consumer Transformation scenario, we see a dramatic increase in the number of domestic heat pumps with 238 in the baseline rising to 98,854 by 2050. A different route to heat decarbonisation is presented

15 Decarbonising home heating - Committee of Public Accounts

16 Heat networks pipelines - GOV.UK

17 Opportunity areas for district heating networks in the UK: second National Comprehensive Assessment - GOV.UK

through the System Transformation scenario where heat decarbonisation is considered more likely to be delivered using Hydrogen. As expected, significantly less heat pumps are projected under this scenario with 56,047 to be installed by 2050. The uptake projections for other heating/cooling technologies are shown below in Figure 9.

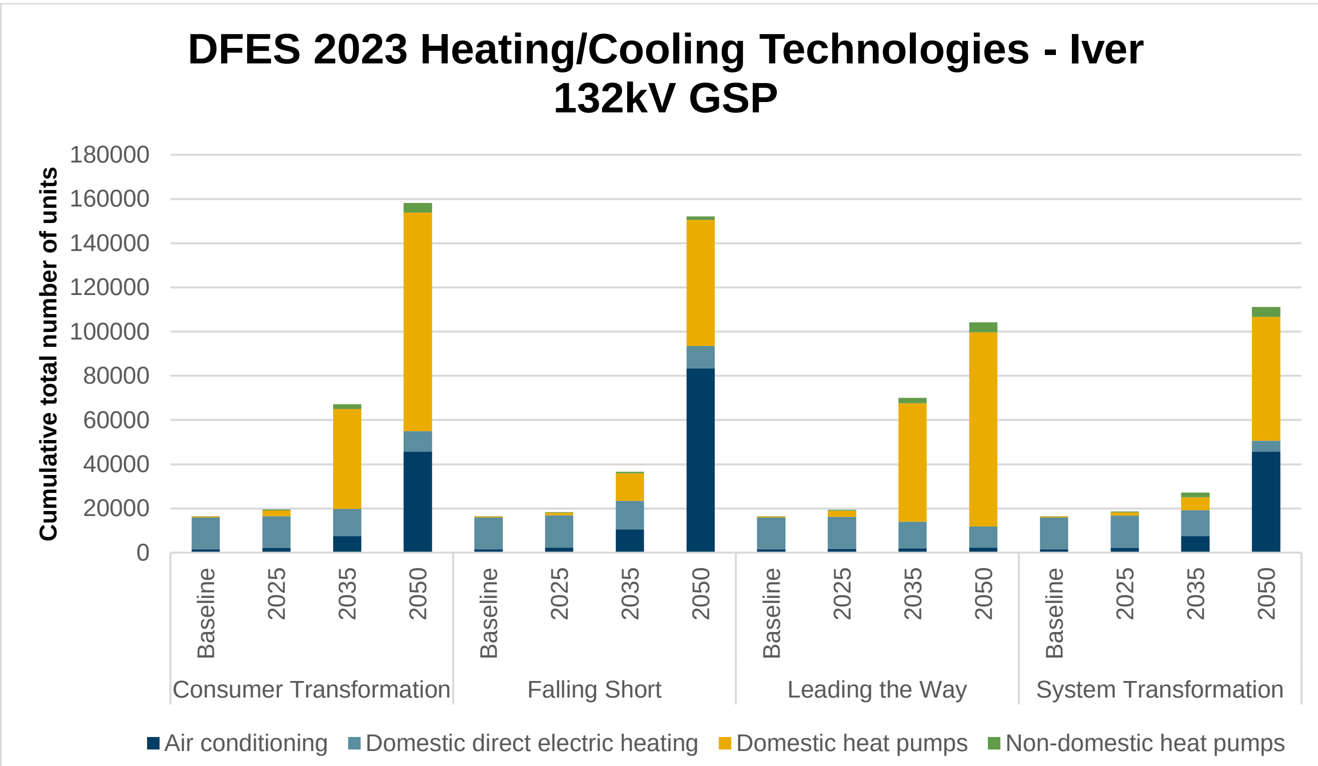


Figure 9 DFES 2023 Heating/Cooling Technologies - Iver 132kV GSP

5.4. New building developments

A key stage in producing the DFES is engagement with Local Authorities. On an annual basis local authorities are requested to provide their current best view on new development plans to inform these projections. The results presented here are the information shared by local authorities during the DFES 2023 update process. Where we do not have responses from local authorities these values are determined from published documents for example adopted local plans.

5.4.1. DFES Projections

In the Iver 132kV GSP supply area, the total number of new domestic developments (number of homes) is projected to be 14,224 by 2050. The DFES also includes projections for different types of non-domestic floorspace with the breakdown for this presented in Figure 10. Please note that as this information is directly fed from local authorities the projections are closely aligned across the four scenarios.

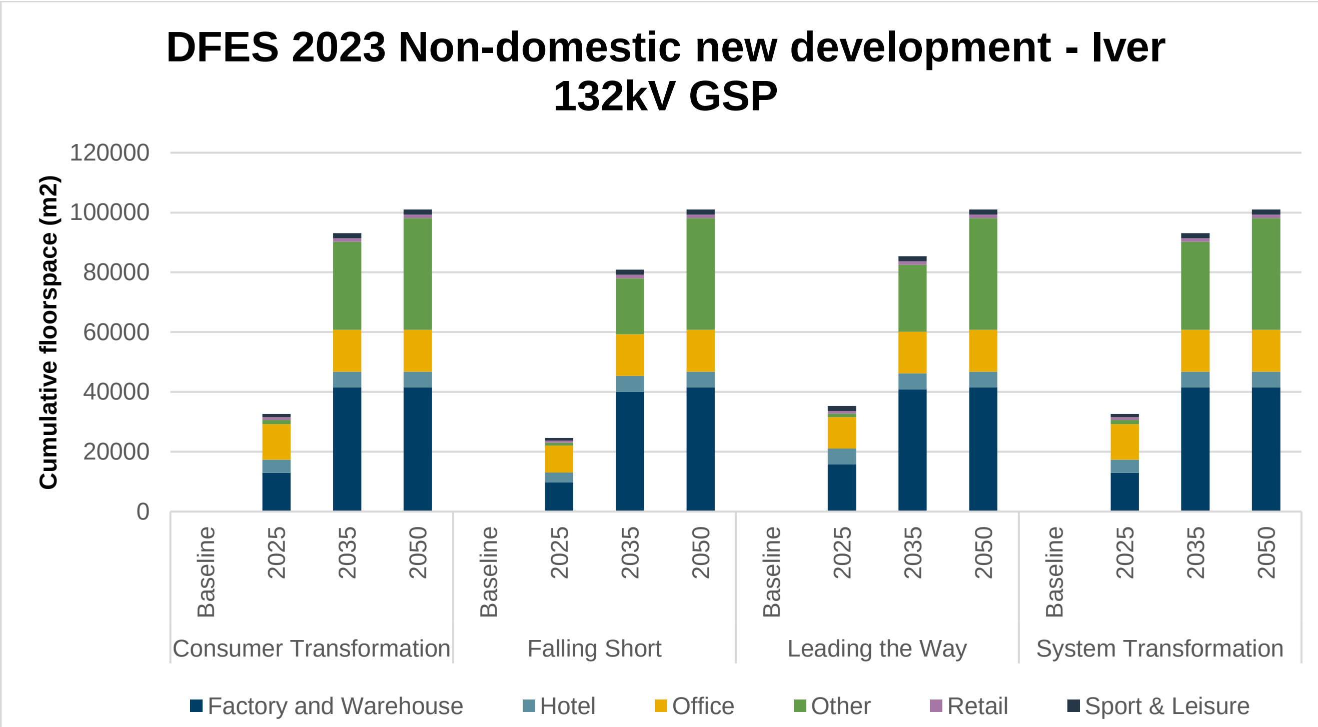


Figure 10 Projected non-domestic new development across Iver 132kV GSP. *Source: SSEN DFES 2023*

5.5. Commercial and industrial electrification

5.5.1. Data Centres

The increased demand from data centres across west London and Slough and the resulting capacity issues is well documented. Recent reports by CBRE indicate that the demand for data centre space in London remains strong, though a lack of available electricity capacity remains an inhibitor to growth.[18]

There are over 600MVA of data centres already connected and contracted with capacity across Iver 132kV GSP with the majority of this load coming from the Slough area.

We have added a building block for data centres in our DFES analysis to allow improved forecasting of future growth. Whilst this is helpful in forecasting future potential, the relative size of connection required by data centres means it is critical to understand their likely specific connection points.

Due to their significant power requirements, data centre projects can have a significant impact on both local transmission and distribution network capacity. It is important for us to continue working closely with NGET and the NESO to continue to develop solutions that will enable efficient data centre connections in the future.

18 CBRE UK, 2023, UK Real Estate Market Outlook 2024: Chapter 17 Data Centres

6. WORKS IN PROGRESS

Network interventions can be caused by a variety of different drivers. Examples of common drivers are load-related growth, specific customer connections, and asset health. Across Iver 132kV GSP these drivers have already triggered network interventions that have now progressed to detailed design and delivery. For this report, these works are assumed to be complete, with any resulting increase in capacity considered to be released. The network considered for long-term modelling is shown in Figure 13. Summary of existing works shown below:

ID	Substation	Description	Driver	Forecast completion	Fully resolves future strategic needs to 2050?
1	Iver 132kV GSP	New 132kV GIS board	Customer connection / DNOA process	2027	✓
2	Iver 132kV – Slough south	New 132kV Circuit from new Iver 132kV Circuit breaker to new Slough South transformer	DNOA process	2027	✗
3	Iver 132kV – Slough	New 132kV Circuit from new Iver 132kV Circuit breaker to new Slough transformer	DNOA process	2027	✗
4	Iver 132kV – Cippenham BSP	Two new 132kV circuits from Iver 132kV to Cippenham BSP	DNOA process	2027	✓
5	Iver 132kV – New Cippenham BSP	Two new 132kV circuits from Iver 132kV to new Cippenham BSP	DNOA process	2031	✓
6	Iver 132kV – Langley Hall Switching Station	New 132kV circuit from Iver 132kV to Langley Hall Switching station	Customer connection	2030	✗
7	Iver 132kV – Denham BSP	Reinforce section of 132kV underground cable	DNOA process	2027	✗
8	New Langley Hall Switching Station	New 132kV switching station to connect Iver 132, Upton BSP and Chalvey BSP	Customer connection	2030	✓

9	New Herschel Street PSS	Reestablish Herschel Street PSS with 33kV switchboard, two new 33/11kV transformers and a new 11kV board	Customer connection	2030	
10	New Cippenham BSP	New Cippenham BSP to be built with two 132/33kV transformers and 33kV switchboard	DNOA process	2031	
11	New Cippenham BSP	Disconnect Petersfield avenue PSS and Herschel Street PSS from Chalvey and connect to New Cippenham	DNOA process	2031	
12	Denham BSP	New Denham 132kV switching station	DNOA process	2030	
13	Denham BSP	Two new 132/33kV transformers to start to rationalise 22kV network	DNOA process	2030	
14	Denham BSP	Two new 132/22kV transformers	DNOA process	2028	
15	Slough South BSP	New 132/33kV transformer at Slough connected to Slough south BSP and 33kV interconnection to the Slough BSP bar.	DNOA process	2030	
16	Slough BSP	New 132/33kV transformer at Slough BSP connected	Customer connection	2027	
17	Gerrards Cross PSS	Two new 33/6.6KV transformers at Gerrards cross to move to the new 33kV bar at Denham to start rationalising the 22kV network.	DNOA process	2030	

18	Denham Avenue PSS	Two new 33/6.6KV transformers at Denham Avenue to move to the new 33kV bar at Denham BSP to start rationalising the 22kV network.	DNOA process	2030	
19	Beaconsfield PSS	Move Beaconsfield from its connection to Upton and Denham BSP's to Loudwater BSP under Amersham GSP, two new 33kV circuits and new 33/6.6kV Transformers at Beaconsfield.	DNOA process	2029	
20	Longford BSP	Two new 132/33kV transformers at Longford BSP	Customer connection	2028	

Table 2 Works already triggered through customer connections and the DNOA process.

Where the above works are marked as not providing sufficient capacity for 2050 peak demands, it is important to note that this relates to the individual primary substation's firm capacity. When considering the further works identified in this report, the holistic plans aim to provide capacity across the GSP for 2050 based on current projections.

Alongside these asset solutions being deployed, flexibility solutions are also being used to release additional capacity.

6.1. Network Schematic (following completion of above works)

The network schematic below in Figure 11 shows the 132kV network with changes highlighted and referenced to the table above. For the 33kV network future schematics, see Appendix D.

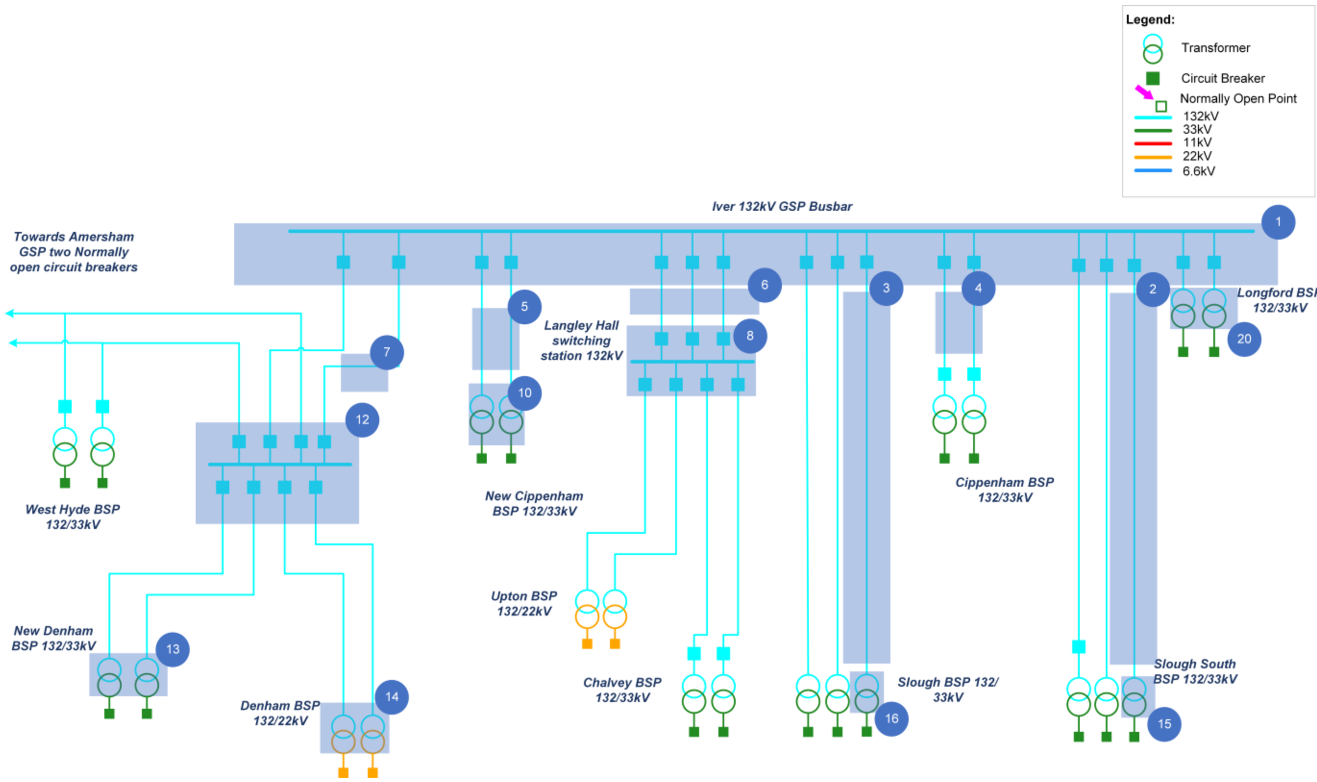


Figure 11 132kV Network schematic following completion of triggered works.

7. SPATIAL PLAN OF FUTURE NEEDS

7.1. Extra High Voltage / High Voltage spatial plans

The EHV/HV spatial plan shown below in Figure 12 shows the projected headroom or capacity shortfall due to demand increases at primary substations across the Iver 132kV SDP study area. Darker blue shades indicate that there is a projected capacity shortfall whereas lighter blue shades indicate that there is headroom capacity based on current projections. EHV/HV spatial plans for the other DFES scenarios are presented in Appendix E.

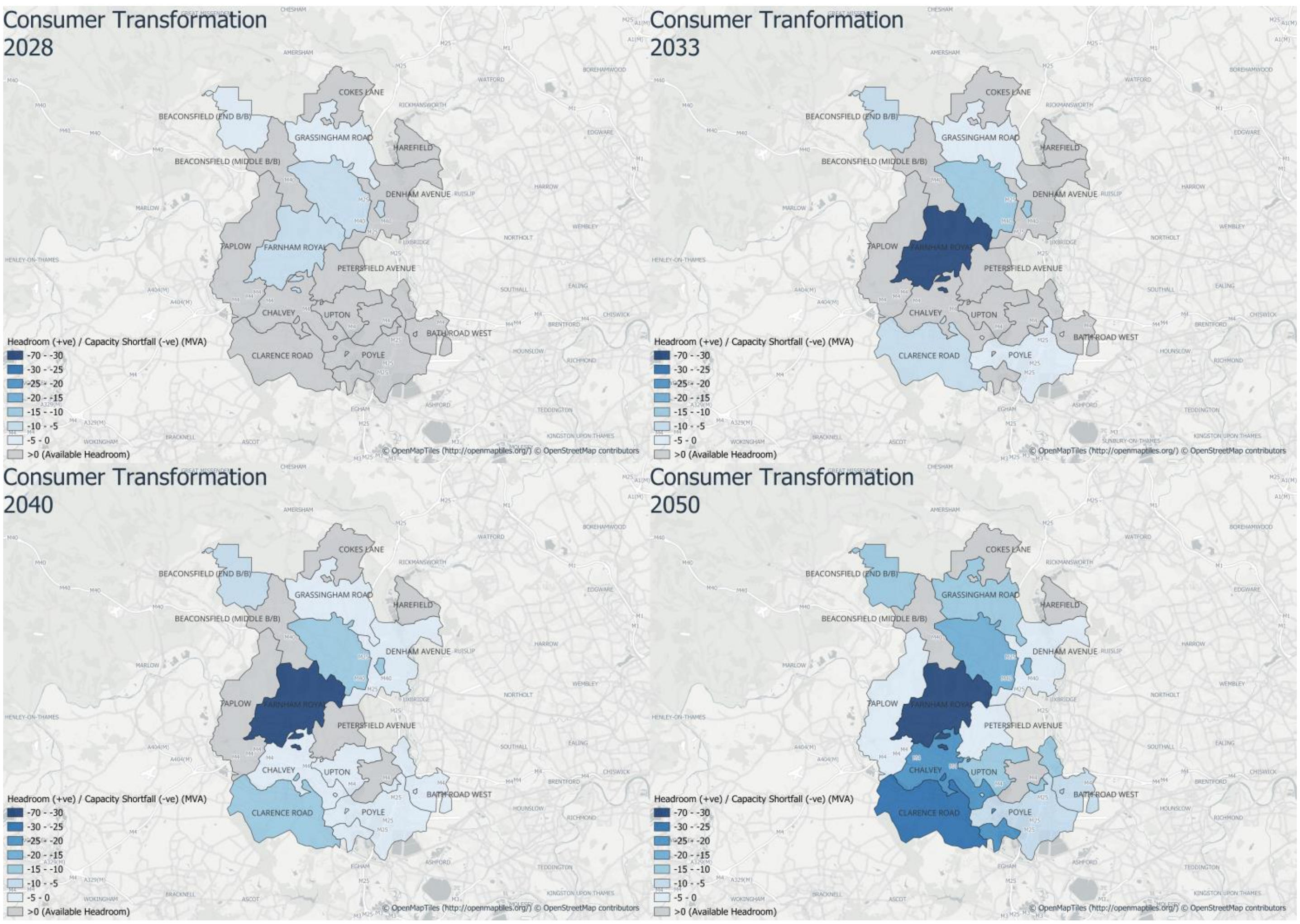


Figure 12 Iver 132kV GSP - EHV/HV Spatial Plans - Consumer Transformation

7.2. HV/LV spatial plans

The HV/LV spatial plans shown below in Figure 13 show the point locations of secondary transformers supplied by Iver 132kV GSP. The points are colourised based on the projected percentage loading with red meaning higher percentage loading and green being lower percentage loading. The HV/LV spatial plans for the other DFES scenarios are available in Appendix F.

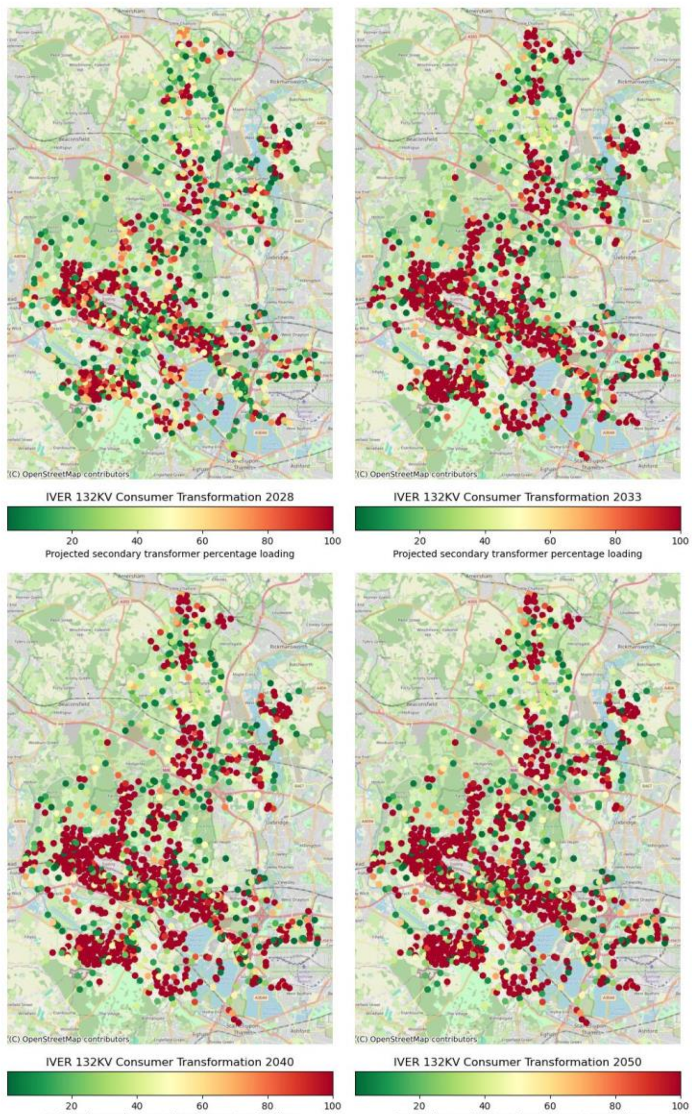


Figure 13 Iver 132kV GSP - HV/LV Spatial Plans - Consumer Transformation

8. SPECIFIC SYSTEM NEEDS AND OPTIONS TO RESOLVE

8.1.1. Overall dependencies, risks, and mitigations

There are a number of overarching risks to the delivery of our strategic plan. Below we list these alongside proposed mitigating actions. We will work with stakeholders to develop these mitigating actions further. Highlight the potential dependencies/risks and what we have done here or plan to do in order to mitigate these risks.

Dependency: Delivery of the reinforcement work highlighted in the works in progress section (section 6) will be required to enable both capacity in the near-term but also to enable the proposed future options in this system needs section.
Risks: Capacity is not released in the near-term. Additional space at the GSP and BSP sites to facilitate new circuit breaker bays is an important consideration.
Mitigation: Near term solutions will be investigated as required to ensure capacity can be released prior to completion of reinforcement works. These include flexible services and active network management schemes to limit delay times for customers and mitigate the capacity risk.

Existing reinforcement schemes consider the future need for space, for example the new BSPs around Slough allows for board extension in the future and ensures that the network is interconnected to increase resilience.

Dependency: Land availability across West London and Slough for expansion of existing sites or development of new sites.
Risks: Land scarcity and high costs result in significant investment required to increase network capacity in this area.
Mitigation: Through the SDP process we are proactively identifying any capacity constraints for a long-time horizon. Early identification of requirements allows for more significant time to identify suitable sites and progress any development.

Dependency: Some of the system needs identified here are far into the future (past 2040), when there is an inherent uncertainty with long term forecasting.
Risks: Unnecessary network investment.
Mitigation: The SDP process means that these plans are updated annually with the most up to date forecasts, this allows us to take a view of system needs at regular intervals and recommend projects for detailed optioneering through the DNOA process when there is enough certainty and evidence for load growth.

8.2. Future EHV System Needs to 2035.

The following table details the near-term to medium-term distribution network system needs that have been identified through power system analysis. While asset solutions are described in the table below it is important to note that the use of flexibility will be evaluated for all schemes to ensure the best possible solution is progressed. For the projects shown in Table 3 we recommend that these are progressed through the DNOA process so that there is sufficient time for solutions to be designed and delivered.

Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	Network State (see glossary)	Proposed option(s) to resolve
Farnham Royal PSS 33/11kV Transformers	2025 - 2030	2025 - 2030	2025 - 2030	2025 - 2030	n-1	All three transformers and 33kV circuits which feed Farnham Royal PSS are forecast to overload ahead of 2030 High level options to resolve could be: - To transfer load to nearby PSS's - Reinforce by replacing the existing 33kV circuits and existing 33/11kV transformers with higher rated units - An additional PSS could be built between Taplow and Farnham Royal to take the future load from both PSS's mitigating the constraints on Farnham Royal and Taplow's 33kV Circuit. This option could also help mitigate the constraints on Petersfield Avenue of some of the capacity could move across to Farnham Royal shifting load on the HV networks towards the new PSS.
Slough to Farnham Royal 33kV circuit	2025 - 2030	2025 - 2030	2025 - 2030	2025 - 2030	n-1	
Clarence Road PSS 33/11kV Transformers	2030 - 2035	2036 - 2040	2030 - 2035	2036 - 2040	n-1	The three transformers and 33kV circuits which feed Clarence Road PSS are forecast to overload Between 2030 and 2035, High level options to resolve could be: - New PSS between Clarence Road and Maidenhead, both substations having constraint issues this would be an effective way of increasing resilience and resolving both constraints. - Reinforcing the existing 33kV circuits and existing 33/11kV transformers at Cippenham
Cippenham to Clarence Road 33kV circuit	2030 - 2035	2041 - 2045	2030 - 2035	2041 - 2045	n-1	
Longford to Poyle 33kV circuit	2030 - 2035	2030 - 2035	2030 - 2035	2036 - 2040	n-1	Both transformers and 33kV circuits which feed Poyle PSS are forecast to overload Between 2030 and 2035, High level options to resolve could be: - Add an additional PSS nearby Poyle and Bath Road west which would alleviate the constraint on the 33kV Circuit towards Poyle and the future transformer constraint at Bath Road West.
Poyle PSS 33/11kV Transformers	2030 - 2035	2036 - 2040	2030 - 2035	2036 - 2040	n-1	

Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	Network State (see glossary)	Proposed option(s) to resolve
						- Reinforce by replacing the present 33kV circuits and 33/11kV transformers at Poyle. - Reinforce by adding an additional 33kV circuit and an additional 33/11kV transformer
Petersfield Avenue PSS 33/11kV Transformers	2030 - 2035	2041 - 2045	2030 - 2035	2041 - 2045	n-1	All three transformers which feed Petersfield Avenue PSS are forecast to overload between 2030 and 2035, High level options to resolve could be: - Reinforce by replacing all three existing transformers with three higher rated units - Explore moving more capacity to the newly triggered Hershel Street PSS - Reinforce by replacing all three existing transformers with two higher rated units
Longford to Bath Road West 33kV circuit	2030 - 2035	2036 - 2040	2030 - 2035	2036 - 2040	n-1	Both 33kV circuits which feed Bath Road West PSS are forecast to overload Between 2030 and 2035, High level options to resolve could be: - Reinforce by replacing the existing 33kV circuits with two higher rated units - Add an additional PSS nearby Poyle and Bath Road West which would alleviate the constraint on the 33kV circuit towards Bath Road West. - Reinforce by adding a third additional 33kV circuit and a new 33kV busbar at Bath Road West PSS - Move load away to other local PSS's through shifting load on the HV network
Slough to Taplow 33kV circuit	2030 - 2035	2046 - 2050	2030 - 2035	2036 - 2040	n-1	Both 33kV circuits which feed Taplow PSS are forecast to overload Between 2030 and 2035, High level options to resolve could be: - Reinforce by replacing the existing 33kV circuits with two higher rated units - Add an additional PSS nearby Taplow which would alleviate the constraint on the 33kV circuit towards Taplow.

Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	Network State (see glossary)	Proposed option(s) to resolve
						- Reinforce by adding a third additional 33kV circuit and a new 33kV busbar at Taplow PSS - Move load away to other local PSS's through shifting load on the HV network
Chalvey BSP transformers	2030 - 2035	2041 - 2045	2030 - 2035	2041 - 2045	n-1	Both 132/33kV transformers which feed Chalvey BSP are forecast to overload between 2030 and 2035, High level options to resolve could be: - Move more load to other BSP's around Slough with new BSPs triggered nearby this may be possible - Reinforce by adding an additional 3rd 132/33kV transformer and 132kV circuit from the new Langley Hall switching station
Upton PSS 22/11kV Transformers	2030 - 2035	2036 - 2040	2030 - 2035	2036 - 2040	n-1	All three transformers which feed Upton PSS are forecast to be overloaded ahead of 2030. High level options to resolve could be: - Reinforce by replacing the existing 22/11kV transformers with higher rated 33/11kV units to future proof if choosing to rationalise the voltage to 33kV - Explore moving more capacity to the newly triggered Hershel Street PSS - Replace the transformers at Upton BSP to 132/33kV transformers, replace the transformers at Upton PSS and Sutton Lane to 33/11kV units to rationalise the voltage and future proof the site out to 2050.

Table 3 Summary of system needs identified in this strategy through to 2035 along with indicative solutions

8.3. Future EHV System Needs to 2050.

Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	Network State (see glossary)	Proposed option(s) to resolve
Harefield to Cokes Lane 22kV circuit	2036 - 2040	2046 - 2050	2030 - 2035	2046 - 2050	n-1	Sections of the 22kV circuit between Harefield and Cokes Lane are forecast to become overloaded between 2036 and 2040. High level options to resolve could be: - Move load to other PSS's in the area which may have more capacity. - Look to rationalise the voltage by uprating the transformers at Denham 22kV BSP to 132/33kV transformers increasing thermal capacity .This would future proof the network moving forwards and enable interconnection with other parts of our 33kV network such as West Hyde BSP. - Reinforce with a larger thermal capacity circuit. - Reinforce with a second 22kV circuit to divert some of the power away from the constrained circuit.
Bath Road West PSS 33/11kV Transformers	2036 - 2040	2036 - 2040	2030 - 2035	2041 - 2045	n-1	All two transformers which feed Bath Road West PSS are forecast to become overloaded between 2036 and 2040. High level options to resolve could be: -Move demand to Bath Road West which has works in progress to reinforce its transformers - Add an additional PSS nearby Poyle and Bath Road West which would alleviate the constraint on the 33kV circuit towards Poyle and the future transformer constraint at Bath Road West. - Add an additional 33/11kV transformer to increase capacity at Bath Road West. - Replace the existing transformers at Bath Road West with higher capacity transformers
Cippenham BSP transformers	2041 - 2045	-	2036 - 2040	-	n-1	Both transformers which feed Cippenham BSP are forecast to become overloaded between 2041 and 2045. High level options to resolve could be:

Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	Network State (see glossary)	Proposed option(s) to resolve
						-Move demand to the new Cippenham BSP and Slough BSP -Reinforce by adding a third transformer at Cippenham BSP, risk of a lack of space with this option at the site. -Reinforce by replacing the existing transformers at Cippenham with larger capacity transformers.
Taplow PSS 33/11kV Transformers	2041 - 2045	-	2041 - 2045	-	n-1	Both 33/11kV transformers which feed Taplow PSS are forecast to become overloaded between 2041 and 2045. High level options to resolve could be: - Reinforce by replacing the existing transformers with two higher rated units - Add an additional PSS nearby Taplow which would alleviate the constraint on the transformers towards Taplow. - Reinforce by adding a third additional transformer and a new 33kV busbar at Taplow PSS - Move load away to other local PSS's through shifting load on the HV network
Denham BSP 132/22kV Transformer	2041 - 2045	-	2046 - 2050	-	n-1	Both 132/22kV transformers which feed Denham BSP are forecast to become overloaded between 2041 and 2045, High level options to resolve could be: - Rationalise the Voltage by uprating the transformers at Denham 22kV BSP to 132/33kV transformers increasing thermal capacity. This would future proof the network moving forwards and enable to interconnect with other parts of our 33kV network
Langley Hall to Chalvey 132kV circuit	2046 - 2050	-	-	-	n-1	The future 132kV circuits between Langley Hall switching station and Chalvey are forecast to become overloaded between 2046 and 2050. High level options to resolve could be: - Move load to other BSP's around Slough . - Reinforce by adding an additional 132/33kV transformer and 132kV circuit from the new Langley Hall switching station

Location of proposed intervention	**CT Year**	**ST Year**	**LW Year**	**FS Year**	**Network State (see glossary)**	**Proposed option(s) to resolve**
						- Reinforce by adding an additional 132/33kV transformer and 132kV circuit from Langley hall switching station at Chalvey BSP
Chalvey PSS Circuit Breakers	2036 - 2040	2041 - 2045	2030 - 2035	2046 - 2050	n-1	The transformer circuit breakers at Chalvey PSS are forecast to become overloaded between 2036 and 2040. High level options to resolve could be: -Reinforce by relocating demand to other primaries in the area -Add additional transformer at Chalvey PSS and operate Chalvey PSS split - Reinforce by adding an additional PSS in the area to relocate demand away from the Chalvey Circuit breakers
Upton BSP transformers	2036 - 2040	2041 - 2045	2030 - 2035	2041 - 2045	n-1	Both 132/22kV transformers which feed Upton BSP are forecast to be overloaded between 2036 and 2040. High level options to resolve could be: - Rationalise the voltage by uprating the transformers at Upton 22kV BSP to 132/33kV transformers increasing thermal capacity. This would future proofing the network moving forwards and enable interconnection with other parts of the 33kV network
Longford BSP Transformers circuit breakers	2036 - 2040	2036 - 2040	2036 - 2040	2036 - 2040	n-1	Both future 132/33kV transformers circuit breakers which will feed Longford BSP are forecast to become overloaded between 2036 and 2040. High level options to resolve could be: -Relocate demand by adding a new BSP in the area or through other PSS's which are connected to other BSP's and GSP's in the area Note -Space constraints at the site prevent addition of new additional transformers

Table 4 Summary of system needs identified in this strategy through to 2050 along with indicative solutions

8.4. Future requirements of the High Voltage and Low Voltage Networks

Our HV/LV spatial plans have shown that there is no clear pattern to future demands on these lower voltage networks. We are therefore planning on a forecast volume basis, and this section provides further context on this work for both the Iver 132kV GSP high voltage and low voltage network needs to 2050.

8.4.1. High Voltage Networks

As well as the EHV system needs identified in the previous section, increased penetration of low carbon technologies (LCTs) connecting to the distribution network will result in system needs on the High Voltage (HV) and Low Voltage (LV) networks. To provide a view on the impact of these technologies on the distribution network here we have used the load model that is produced by SSEN's Data and Analytics team.[19]
The load model is a machine learning product which estimates a half-hourly annual demand profile for each household based on a series of demographic, geographic and heating type factors. This enables us to estimate capacity on the electricity network while protecting individual customers data privacy by using modelled data. These views are then aggregated up the network hierarchy based on the combinations of customers associated with each asset. This view is supplemented with the DFES to highlight the projected impact of LCTs on the network.

For the primary substations supplied by Iver 132kV GSP, the percentage of secondary substations where projected peak loading exceeds the nameplate rating of the secondary transformer was taken from the load model data. Figure 13 demonstrates how this percentage changes under each DFES scenario from now to 2050.

To satisfy these requirements a variety of solutions will need to be investigated. It is likely that a combination of flexibility and asset replacement will be employed to resolve the projected HV system needs. It is important to note that for HV needs, flexibility is likely to be provided through Distributed Energy Resources (DER), Consumer Energy Resources (CER), and domestic/commercial Demand Side Response (DSR). One of the challenges associated with procuring flexibility to High Voltage and Low Voltage system needs is that only a small number of customers can provide a flexible service due to the requirement to be supplied by a specific secondary transformer. As the role of aggregators develops, we may see a shift in the potential for flexibility in an area. Where the magnitude of an overload is too large for flexibility to be feasible, addition of new assets or asset replacement will be necessary.

19 SSEN Open Data Portal, 2023, SSEN Secondary Transformer – Asset Capacity and Low Carbon Technology Growth.

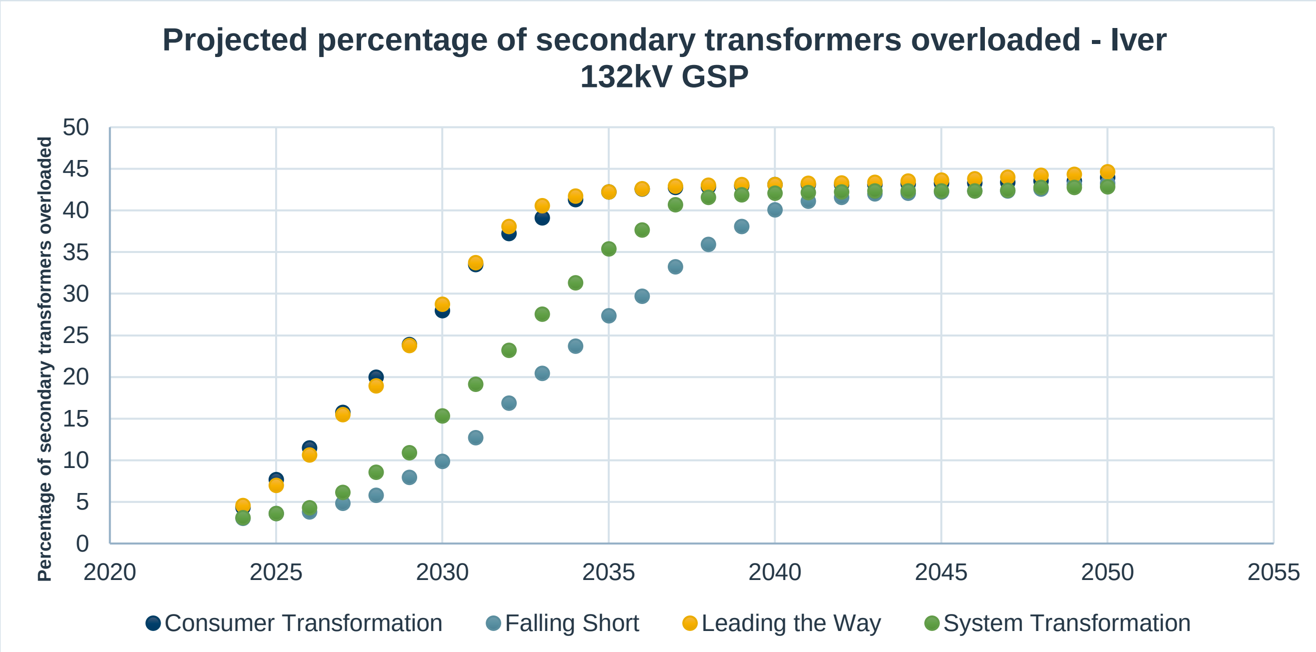


Figure 14 Iver 132kV GSP Projected secondary transformer loading. *Source: SSEN Load Model*

Considering the Just Transition in HV development

SSEN are building on the findings from the Vulnerability Future Energy Scenarios (VFES). This innovation project investigated how the use of new forecasting techniques, along with data analytics and expert validation could be used to identify and forecast consumers in vulnerable situations as we move toward net zero. Use of the outputs from the VFES enable SSEN to develop the network in a way that truly accounts for the levels of vulnerability our customers in different locations face.

One of the outputs from this innovation project was the report produced by the Smith Institute.[20] This work groups LSOAs[21] that share similar drivers of vulnerability. The groupings were informed by mathematical analysis of demographic data and of SSEN's priority service register, using machine learning to model the complex relationships that exist between the two. The resulting group numbers and descriptions are shown in Table 5.

20 VFES Machine Learning Discovery of Vulnerability Signatures Report, Smith Institute, 08/11/2022, (NIA SSEN 0063: VFES – Vulnerability Future Energy Scenarios | SSEN Innovation)

21 Lower layer Super Output Areas (LSOAs) (Statistical geographies - Office for National Statistics)

Table 5

Group Number & Level of Vulnerability	Description of Group
1 – Very high	Driven up by higher levels of poor health and disability/mental health benefit claimants, reduced by smaller household sizes.
2 – High	Driven up by larger household sizes, reduced by lower elderly population levels.
3 – High	Driven up by larger elderly population levels, reduced by lower levels of disability and mental health benefit claimants.
4 – Slightly higher than average	Driven up by larger elder population levels and moderately higher provision of care, reduced by smaller household sizes.
5 – Slightly lower than average	Driven down by lower elderly population levels and larger levels of ethnic diversity, increased by higher household sizes and greater provision of care.
6 – Low	Driven down by lower level of bad health and disability/mental health benefit claimants, increased by moderate elderly population levels and household sizes.
7 – Very low	Driven down by substantially lower elderly population levels, less provision of care and a higher level of households in private rented dwellings.

To understand the vulnerability groupings across Iver 132kV GSP supply area we have visualised the LSOA categorisation for the study area. By overlaying secondary transformers that are projected to be overloaded by 2028 (under the Consumer Transformation scenario), we begin to understand the crossover between network capacity needs and areas categorised as high vulnerability through the VFES work. This is shown below in Figure 15.

The majority of the Iver 132kV GSP area falls into category 6 with low vulnerability. This low level of vulnerability is driven down by lower levels of poor health and increased by moderate elderly population levels and household sizes. There are three notable types of areas seen in Figure 15 with higher vulnerability. The first is a wider area with broadly high vulnerability – this is seen around Harefield where there is a large semi-rural area of higher vulnerability. The second is a smaller area of higher vulnerability in the Burnham area of Slough. The third is again a smaller area to the south east of the Iver 132kV GSP supply area in the north west of Stanwell just next to Heathrow Airport.

By overlaying the point locations of secondary transformers projected to be overloaded (in 2028 under the Consumer Transformation scenario) we identify areas that are categorised as more vulnerable and also may have capacity shortfalls at the secondary network level. More vulnerable groups may have lower level of adoption of LCTs and therefore provide less ability to manage overloads through flexibility services. Further they may point towards areas of social housing where there could be a more sudden rollout of LCTs such as heat pumps in the future. They may also highlight areas where there is an evidential need for energy efficiency measures.

We recommend the use of these insights to prioritise work in heavily loaded areas of our network ensuring the network remains secure, stable, and resilient in the areas where vulnerable customers would be most disadvantaged by power outages.

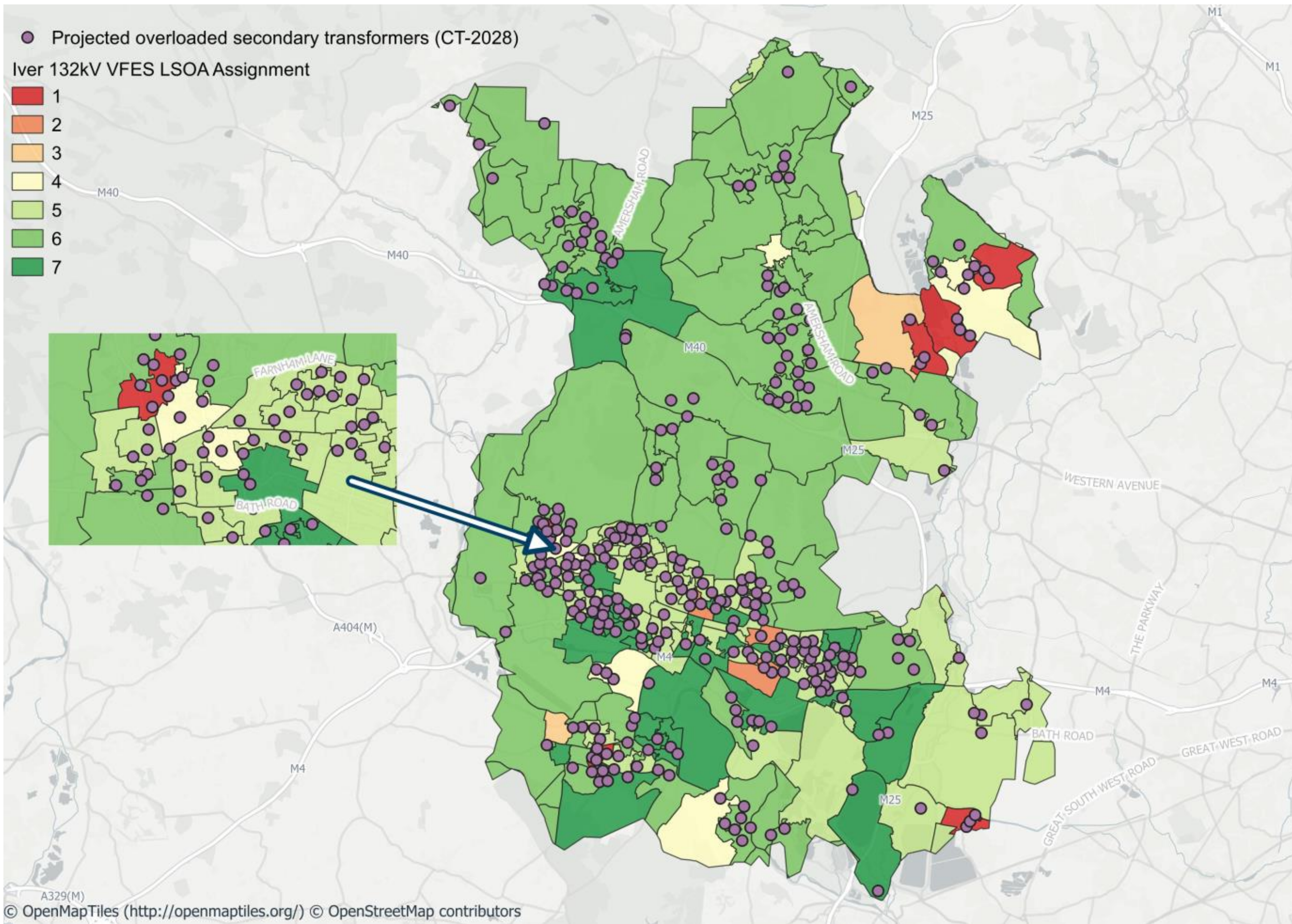


Figure 15 Iver 132kV GSP area VFES output with secondary transformer overlay.

8.4.2. Low Voltage Networks

Drivers for interventions in low voltage networks may be either capacity related or be driven by voltage requirements. We are progressing options to resolve both of these drivers. From a network perspective the solution typically involves upgrading the number of LV feeders to split/ balance the load and improve voltage or to install another substation at the remote end of the LV network to balance load and improve voltage. In both instances, flexibility at a local level, especially voltage management products linked to battery export and embedded generation such as solar is likely to be required alongside traditional reinforcement.

We are leveraging recent innovation work through Project LEO (Local Energy Oxfordshire) and My Electric Avenue to inform this strategy. Enhanced network visibility through Smart meter data analytics and low-cost substation feeder monitoring is also necessary to enable appropriate dispatch of services and network reconfiguration.

Capacity driven needs – Thermal constraints tend to materialise in the sections of cable leading to the substation (transformer) where multiple customer loads join. We are modelling requirements out to 2050 leveraging low voltage monitoring and metering equipment combined with analytical techniques. This will demonstrate how the magnitude of the system need of the LV network across Iver 132kV changes across scenarios and years out to 2050.

Voltage driven needs – Generally, connection of Low Carbon Technology and large loads such as heat pumps is limited by voltage constraints before thermal constraints when located more than around 150m from the local secondary transformer. Increased loading on our low voltage networks can reduce the voltages to consumer premises. This is a non-liner relationship and as such requires more complex analysis. We are currently undertaking analysis to better understand the extent of this future need.

Initial analysis indicates that 20% of low voltage feeders may need intervention by 2035 and 23% by 2050 under the CT scenario as shown in Figure 16. The need is unlikely to be triggered until 2028 onwards. However, due to the timeline to grow workforce, with jointing skills taking typically 4 years to be fully competent, it is necessary to start recruitment and initiate programmes ahead of need to be able to deliver the required volumes from 2028 onwards.

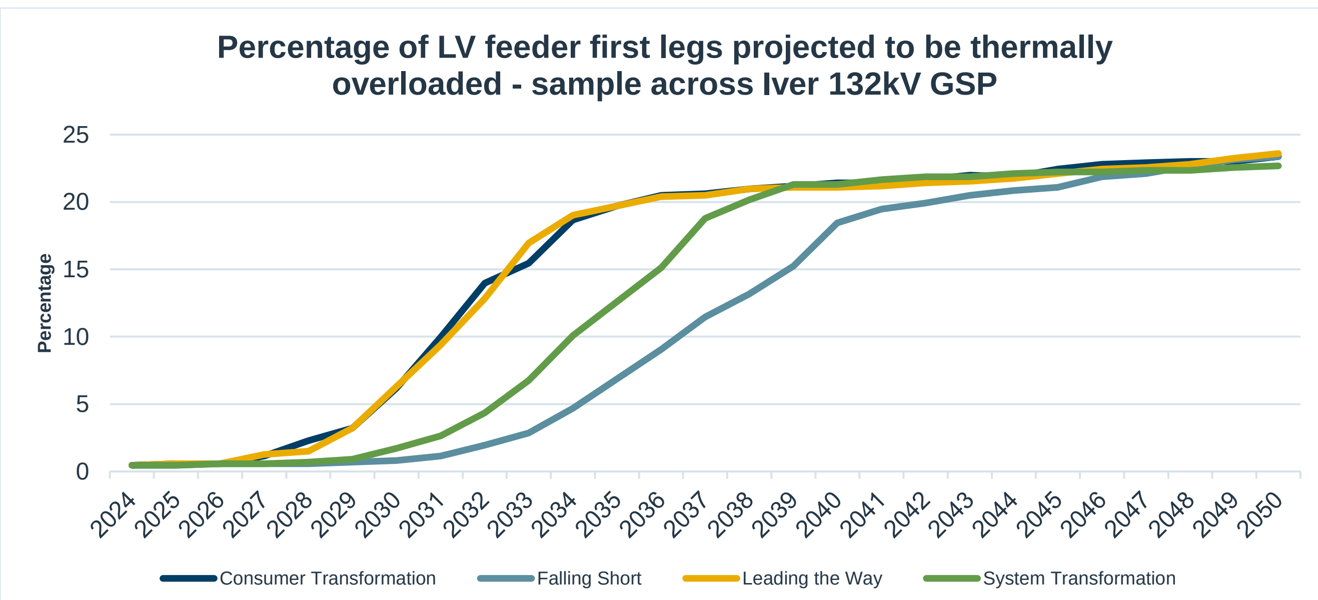


Figure 16 Percentage of LV feeders projected to be overloaded under Iver 132kV GSP

9. RECOMMENDATIONS

The review of stakeholder insights and the SSEN 2023 DFES analysis provides a robust evidence base for load growth across Iver 132kV GSP group in both the near and longer term. Drivers for load growth across Iver 132kV GSP arise from multiple sectors and technologies. These drivers impact not only our EHV network but will drive system needs across all voltage levels.

Across Iver 132kV GSP group, a significant volume of work at both 132kV and 33kV has already been triggered through the DNOA process and published in DNOA Outcomes Reports. This delivers a significant amount of additional capacity in the area over the next decade. These are driven by customer connections and system needs that will arise this decade but are being developed to meet 2050 needs.

The findings from this report have provided evidence for 7 key recommendations:

1. System needs that have been identified at earlier timescales (2030-2035) should be studied in more detail. Work in these timescales should be progressed for more detailed assessment through the DNOA process. This relates to the assets tabulated in section 8.2.

2. Voltage rationalisation should be considered to remove network constraints and increase resilience through interconnecting to the rest of the SSEN network. This SDP recommends rationalisation of non-standard voltages (22kV and 6.6kV) within this geographic area.

3. Considering some of the dense urban areas that Iver 132kV GSP supplies, for example Slough, further investigation of the HV and LV network requirements is recommended. Efficient solutions will help ensure minimal disruption in these areas where a significant amount of street work will impact a large number of customers.

4. We are aware that West London is a potential area for heat networks. SSEN should work closely with local authorities and heat network developers to better understand the likelihood of future heat networks within the area to improve forecasting.

5. Considering the significant load growth expected across Iver 132kV GSP, engagement with NGET and NESO should be proactive to create a long-term plan for the area which includes consideration of future demands at neighbouring.

6. With large works in progress and further new substations which could be triggered into the future, early engagement with Local authorities and other land owners should be explored to find new substation locations early. Where these are identified early capacity could be released sooner than forecast.

7. There is a large proportion of Iver 132kV's load utilised by a smaller number of large energy users within the area, further engagement with these large energy users to identify their future energy needs to improve our future energy forecasting should be done into the future.

Actioning these recommendations will allow SSEN to develop a network that supports local net zero ambitions and enables growth in the local economy. By doing so, this will ultimately contribute to net zero targets at a national level.

Appendix A DFES 2024 Projections

NESO publishes the FES framework annually, and this is adopted for the DFES. The 2024 edition outlines three new pathways (Holistic Transition, Electric Engagement, and Hydrogen Evolution) that achieve net zero by 2050 against a counterfactual. The pathways framework is shown below in Figure 17

The following charts show the latest DFES 2024 projections similar to those in section 5 with the updated pathways.

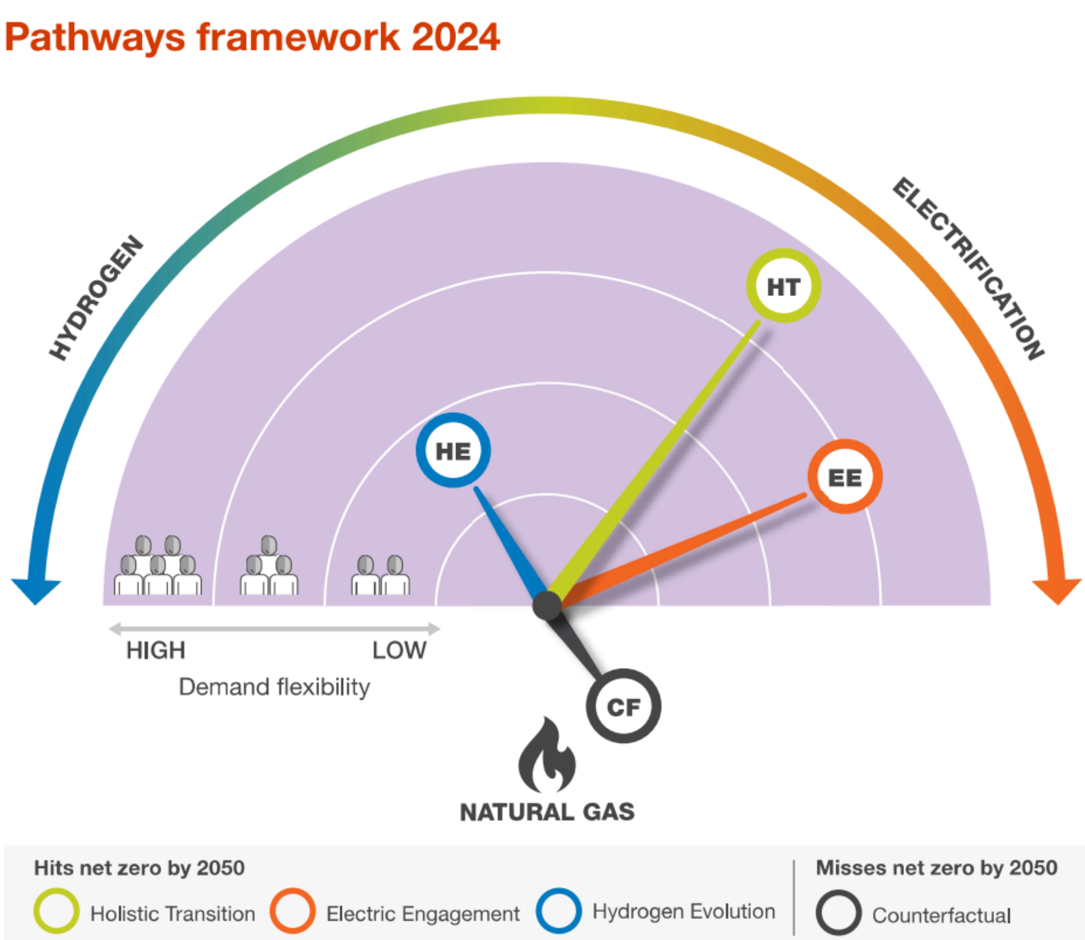


Figure 17 The FES 2024 scenario framework (source: NESO)

DFES 2024 Generation

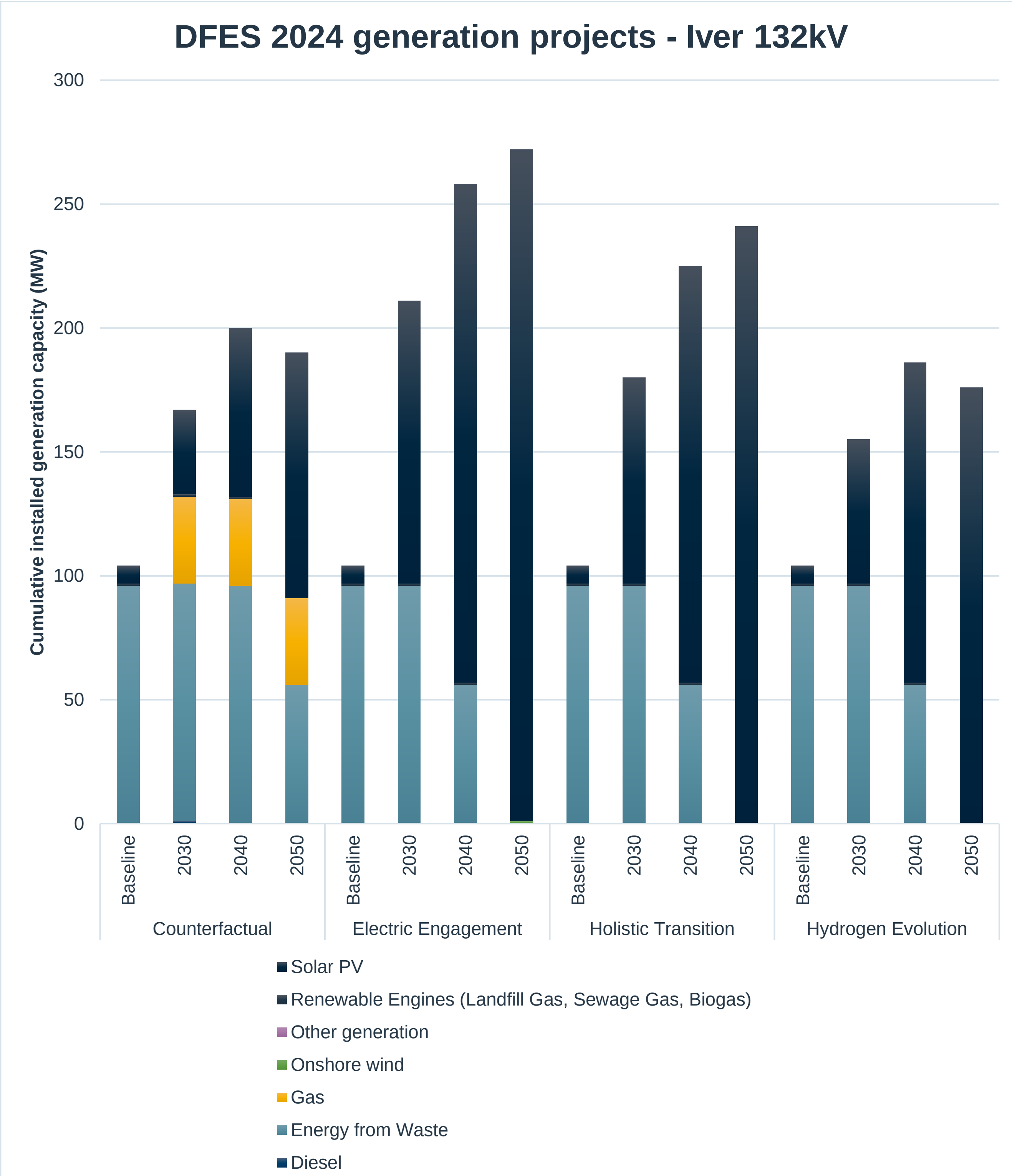


Figure 18 Projected cumulative distributed generation capacity Iver 132kV GSP (MW). *Source: SSEN DFES 2024*

DFES 2024 Transport

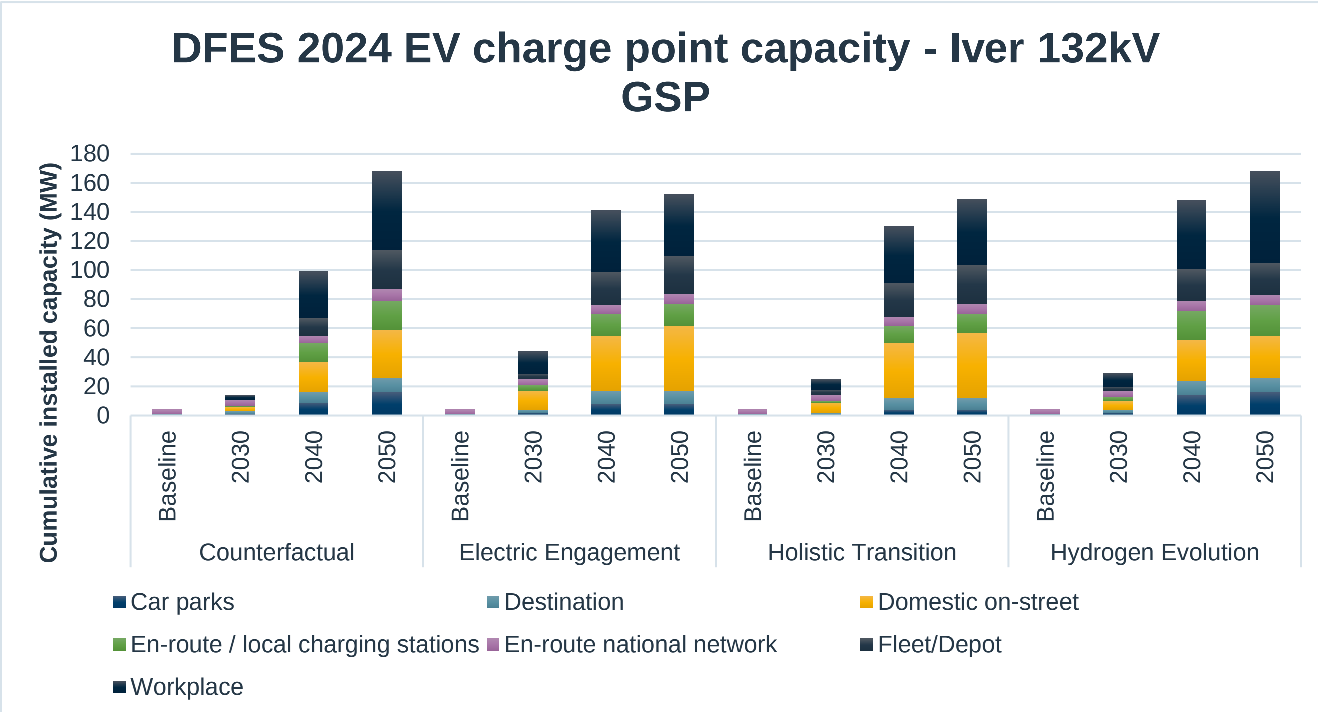


Figure 19 Projected EV charge point capacity across Iver 66kV GSP. *Source: SSEN DFES 2024*

DFES 2024 Heat

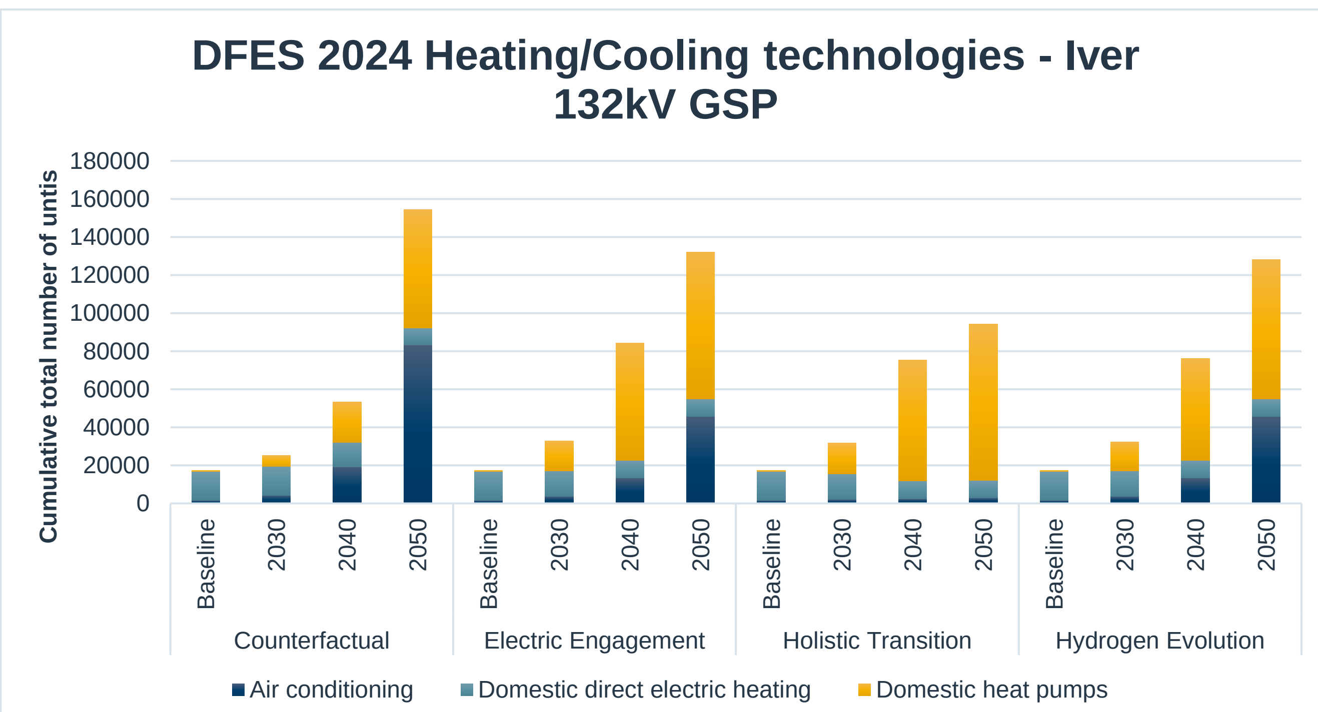


Figure 20 Projected number of heating/cooling technologies across Iver 66kV GSP. *Source: SSEN DFES 2024*

DFES 2024 Building Developments

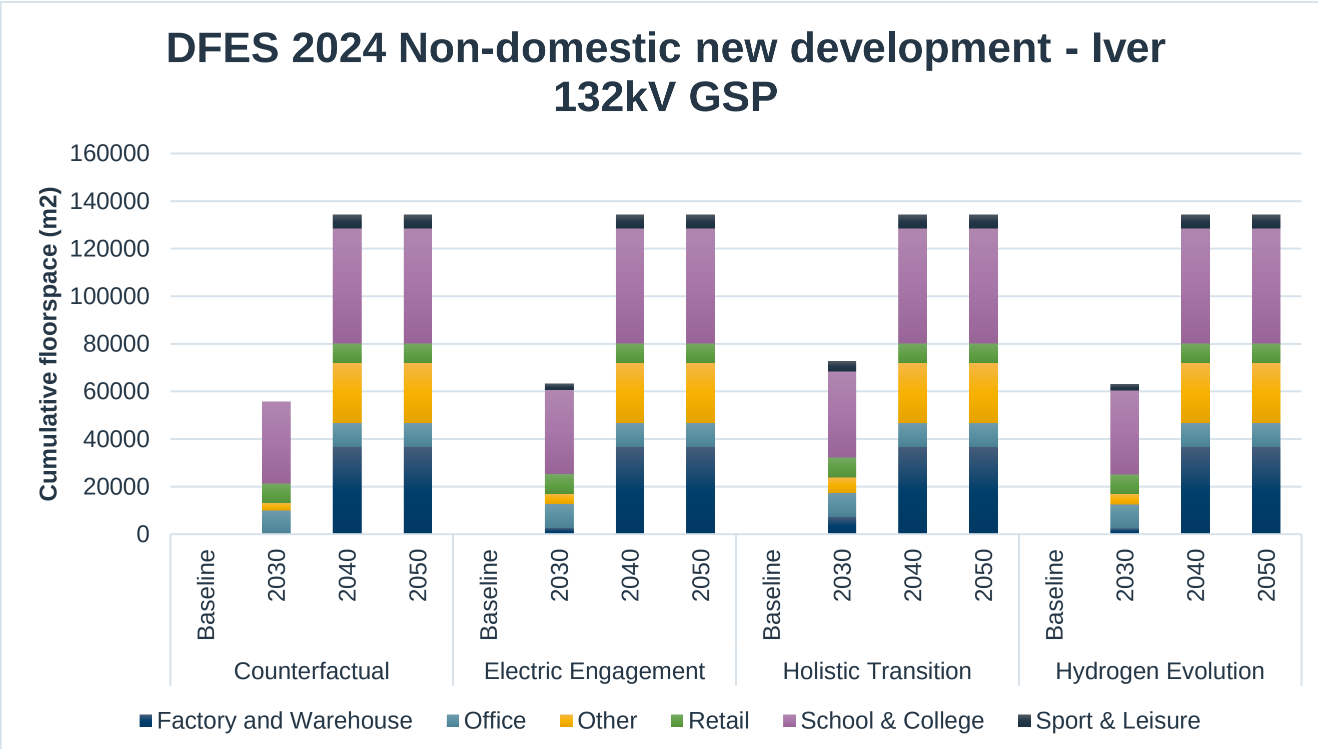


Figure 21 Projected non-domestic new development across Iver 132kV GSP. *Source: SSEN DFES 2024*

Appendix B Further detail on existing network infrastructure-Primary Substations

Table 6 Primary Substations supplied by Iver 132KV GSP

Substation Name	Site Type	Number of Customers Served	2023 Substation Maximum MVA (Season)
BATH ROAD WEST	Primary Substation	1,660	12.24
BEACONSFIELD (END B/B)	Primary Substation	2,480	4.21
BEACONSFIELD (MIDDLE B/B)	Primary Substation	4,465	10.40
CHALVEY	Primary Substation	22,850	33.35
CLARENCE ROAD	Primary Substation	17,826	28.74
COKES LANE	Primary Substation	2,573	5.51
DENHAM AVENUE	Primary Substation	4,204	8.82
FARNHAM ROYAL	Primary Substation	19,552	24.70
GERRARDS CROSS	Primary Substation	5,527	12.35
GRASSINGHAM ROAD	Primary Substation	6,826	12.39
HAREFIELD	Primary Substation	2,554	4.91
PETERSFIELD AVENUE	Primary Substation	10,188	18.21
POYLE	Primary Substation	5,139	17.12
SUTTON LANE	Primary Substation	5,053	8.08
TAPLOW	Primary Substation	8,577	12.80
UPTON	Primary Substation	11,539	19.06

Appendix C Existing Network Schematics

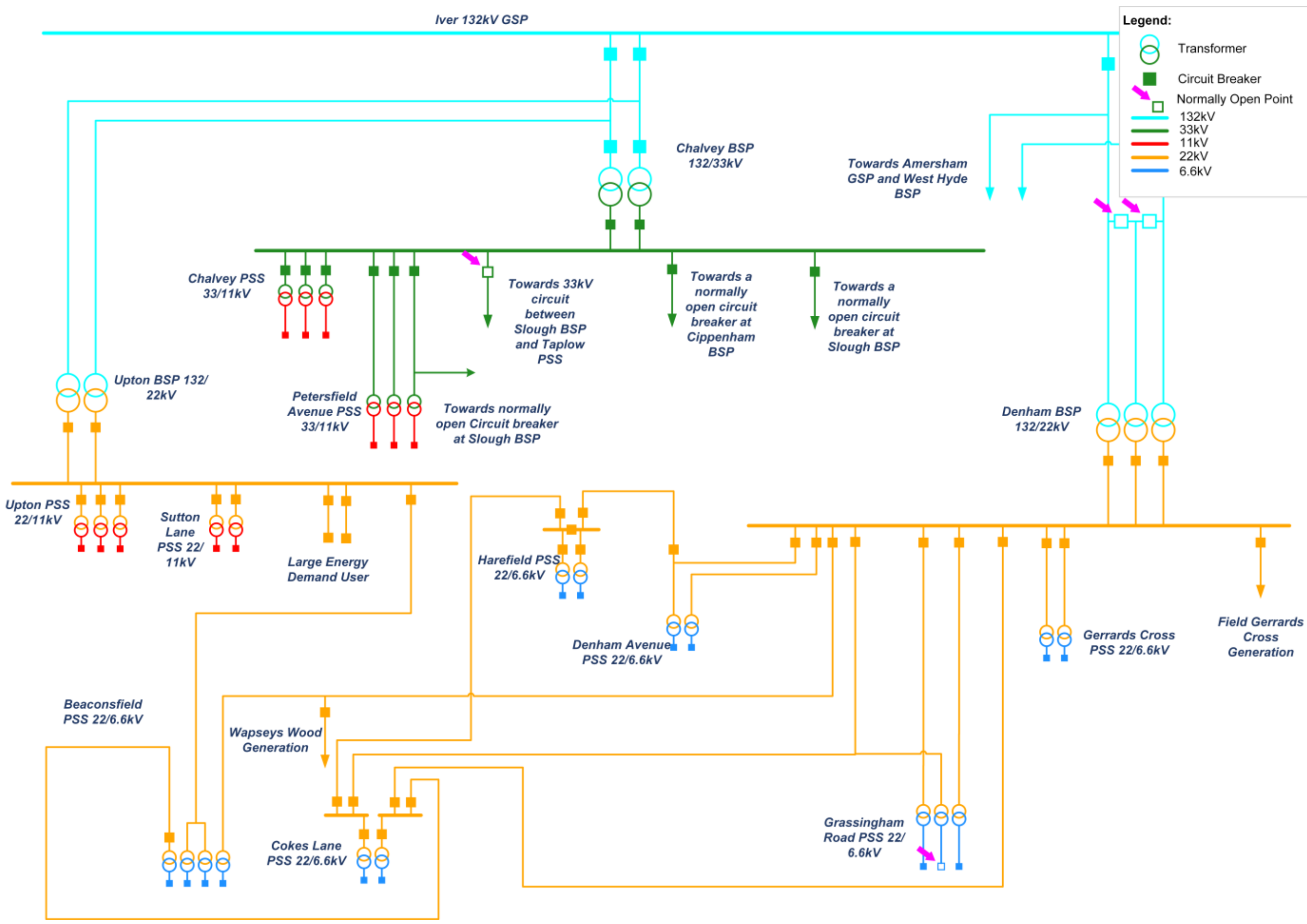


Figure 22 Chalvey, Upton and Denham BSP Simplified existing network Schematic

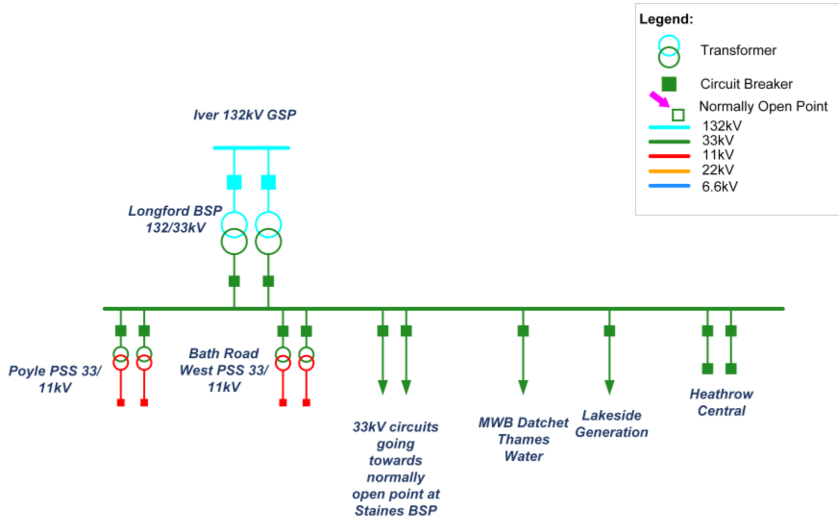


Figure 23 Longford BSP Simplified existing network Schematic

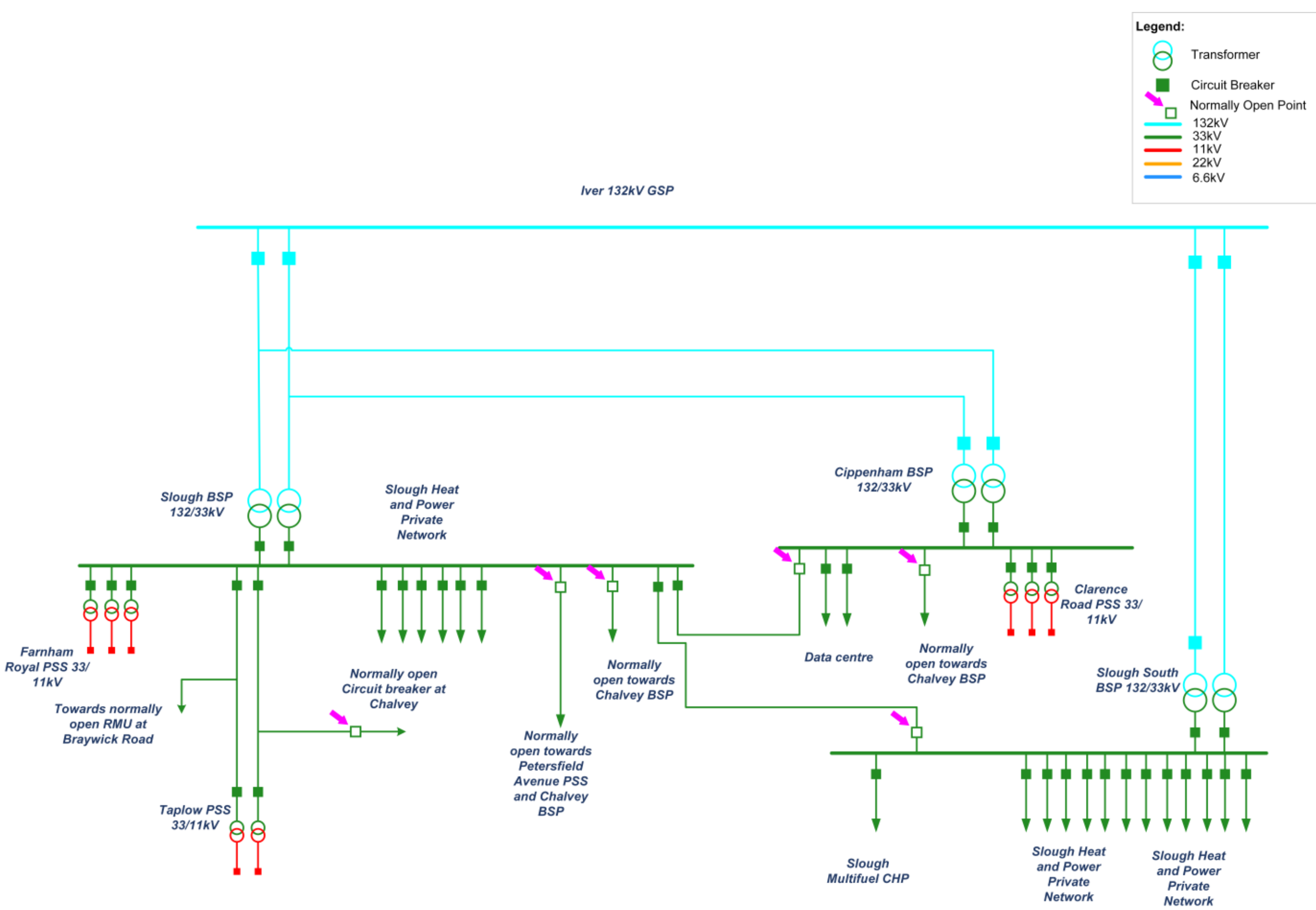


Figure 24 Slough, Cippenham and Slough South BSP Simplified existing network Schematic

Appendix D Existing Network Schematics following completion of triggered works

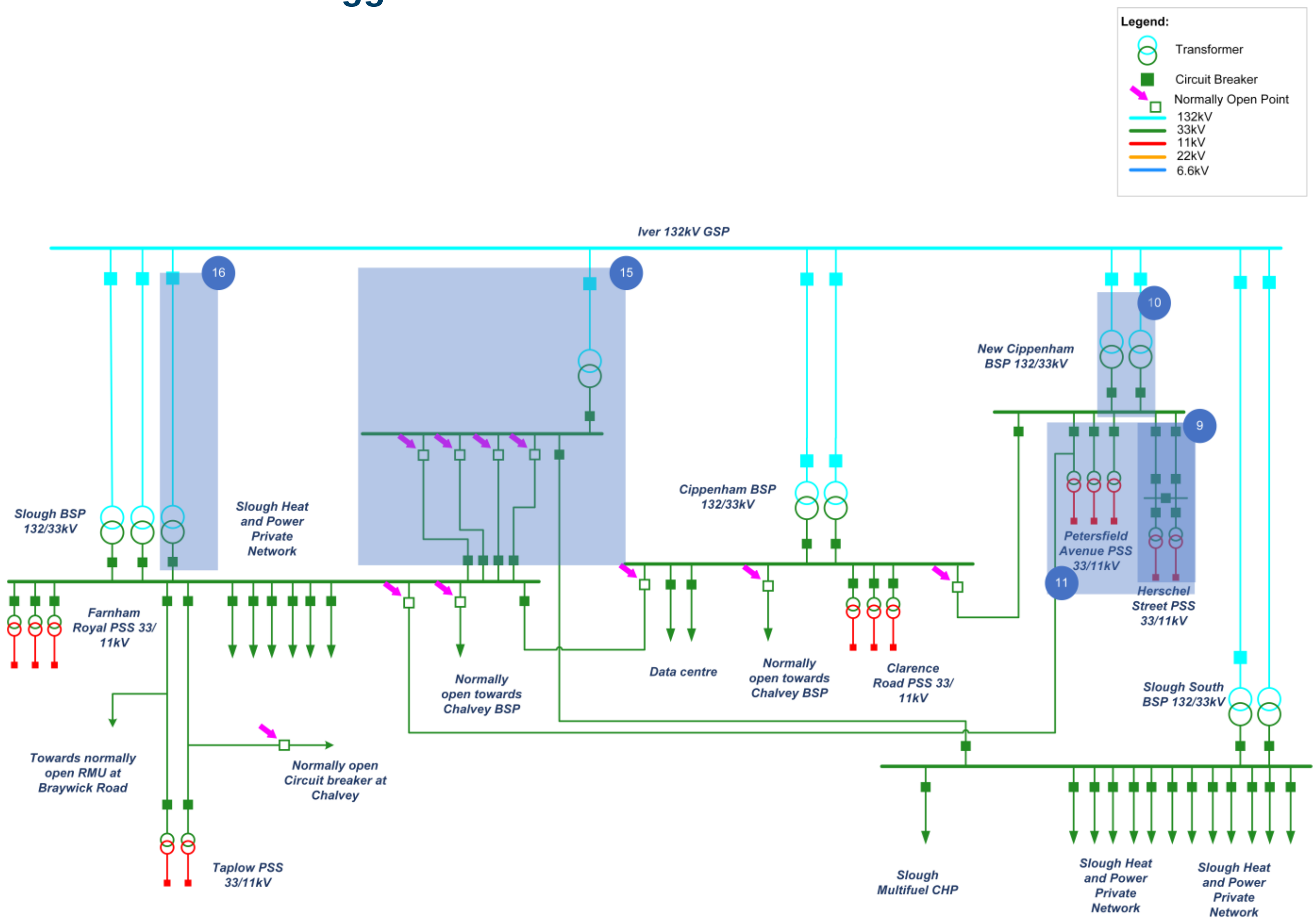


Figure 25 Slough, Cippenham and Slough South BSP Simplified Future Network Schematic

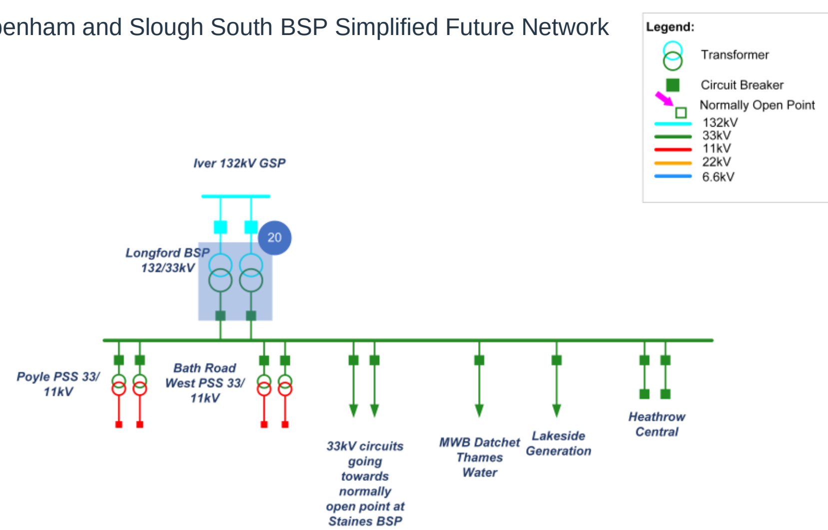


Figure 26 Longford BSP Simplified Future Network Schematic

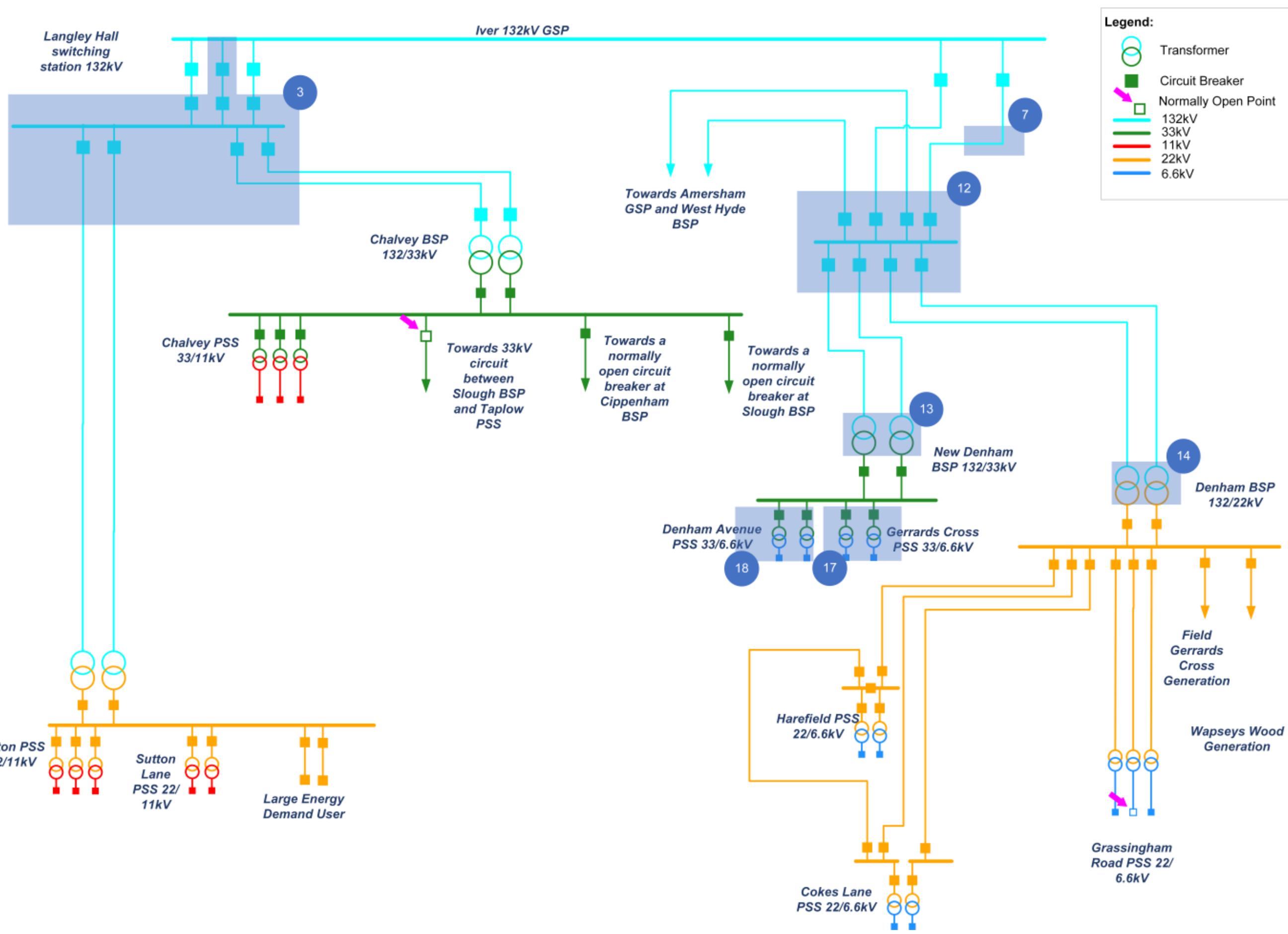


Figure 27 Chalvey, Upton and Denham BSP Simplified Future Network Schematic

Appendix E EHV/HV spatial plans for other DFES scenarios

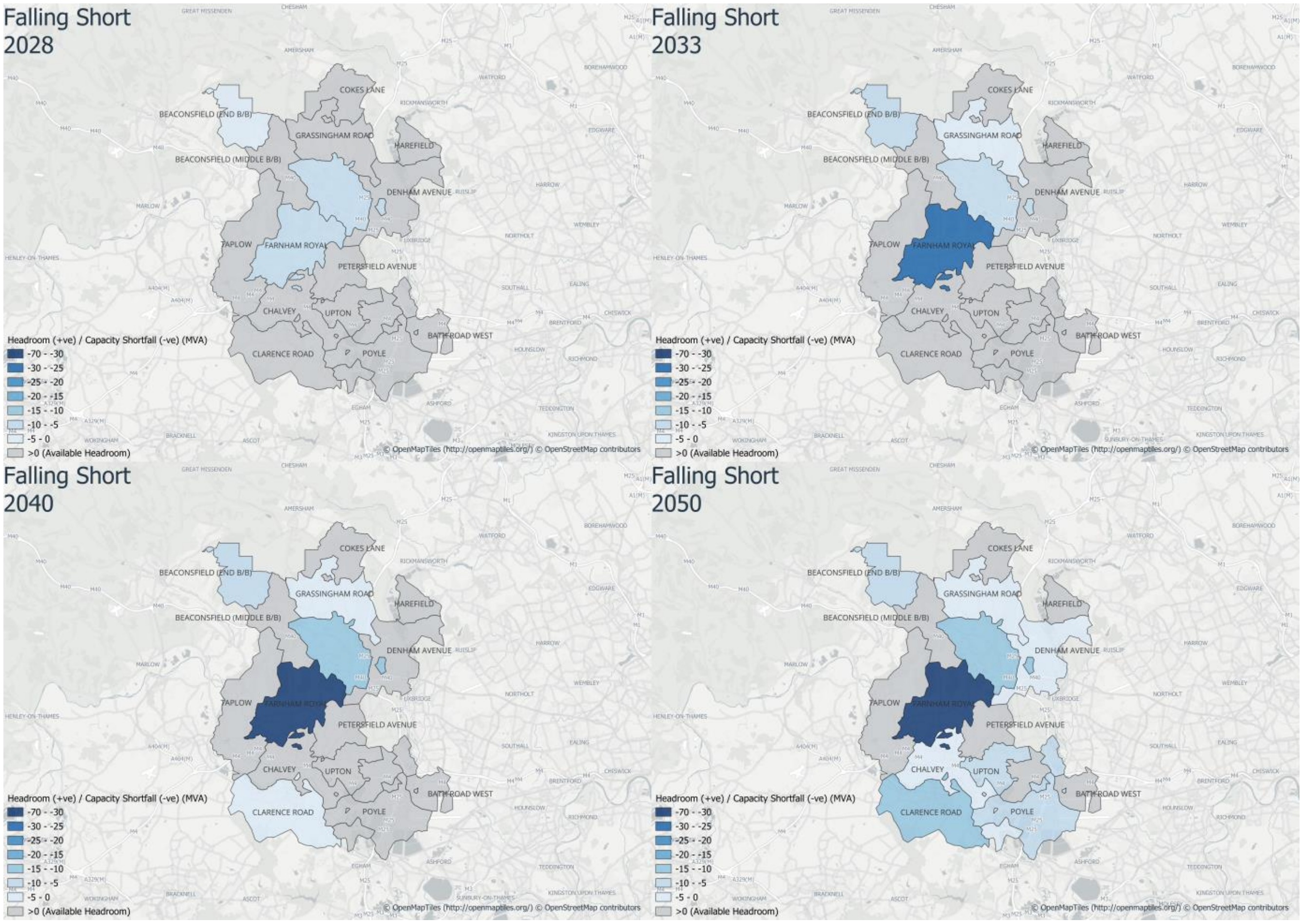


Figure 28 Iver 132kV GSP – EHV/HV Spatial Plan – Falling Short

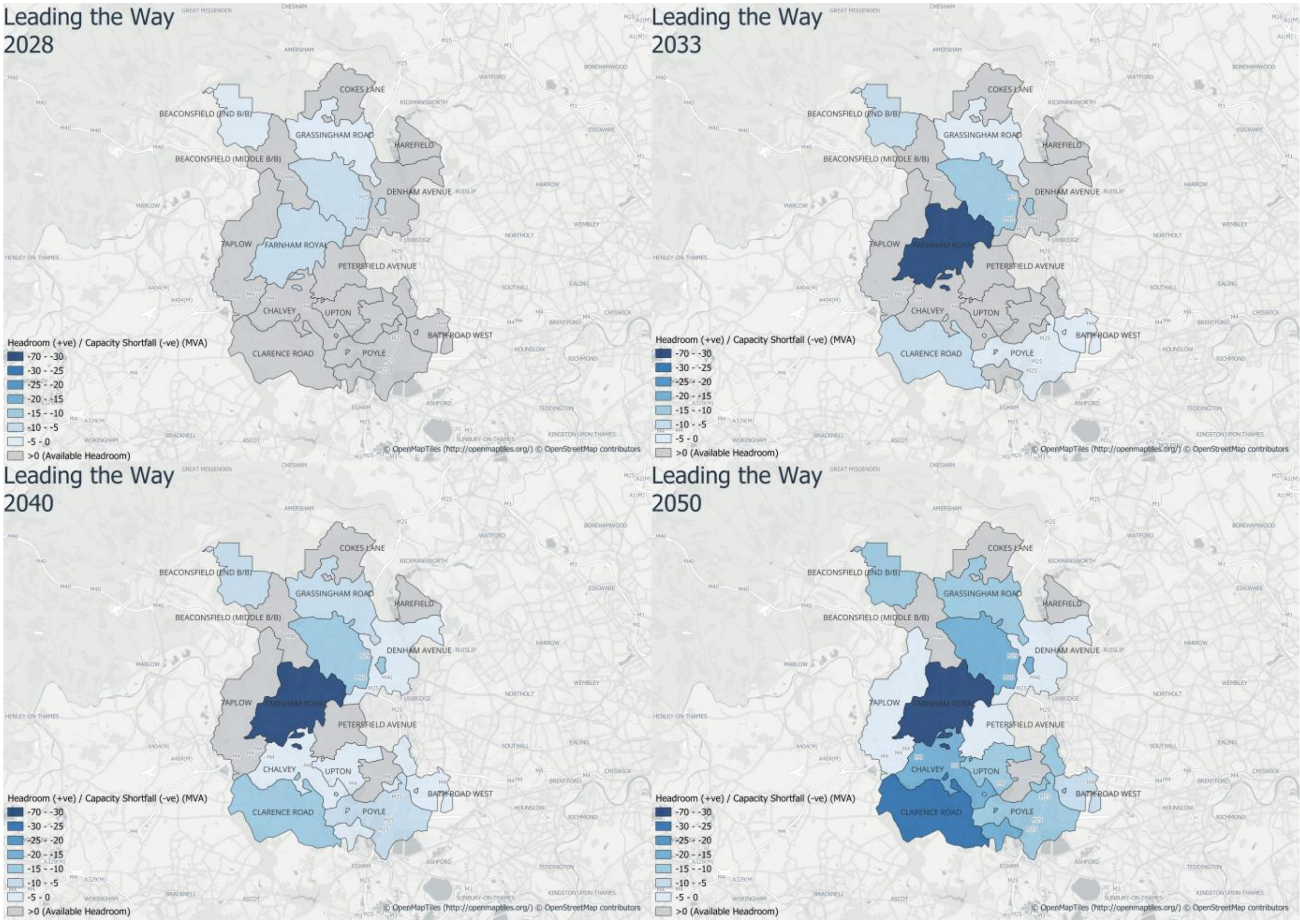


Figure 29 Iver 132kV GSP – EHV/HV Spatial Plan - Leading the Way

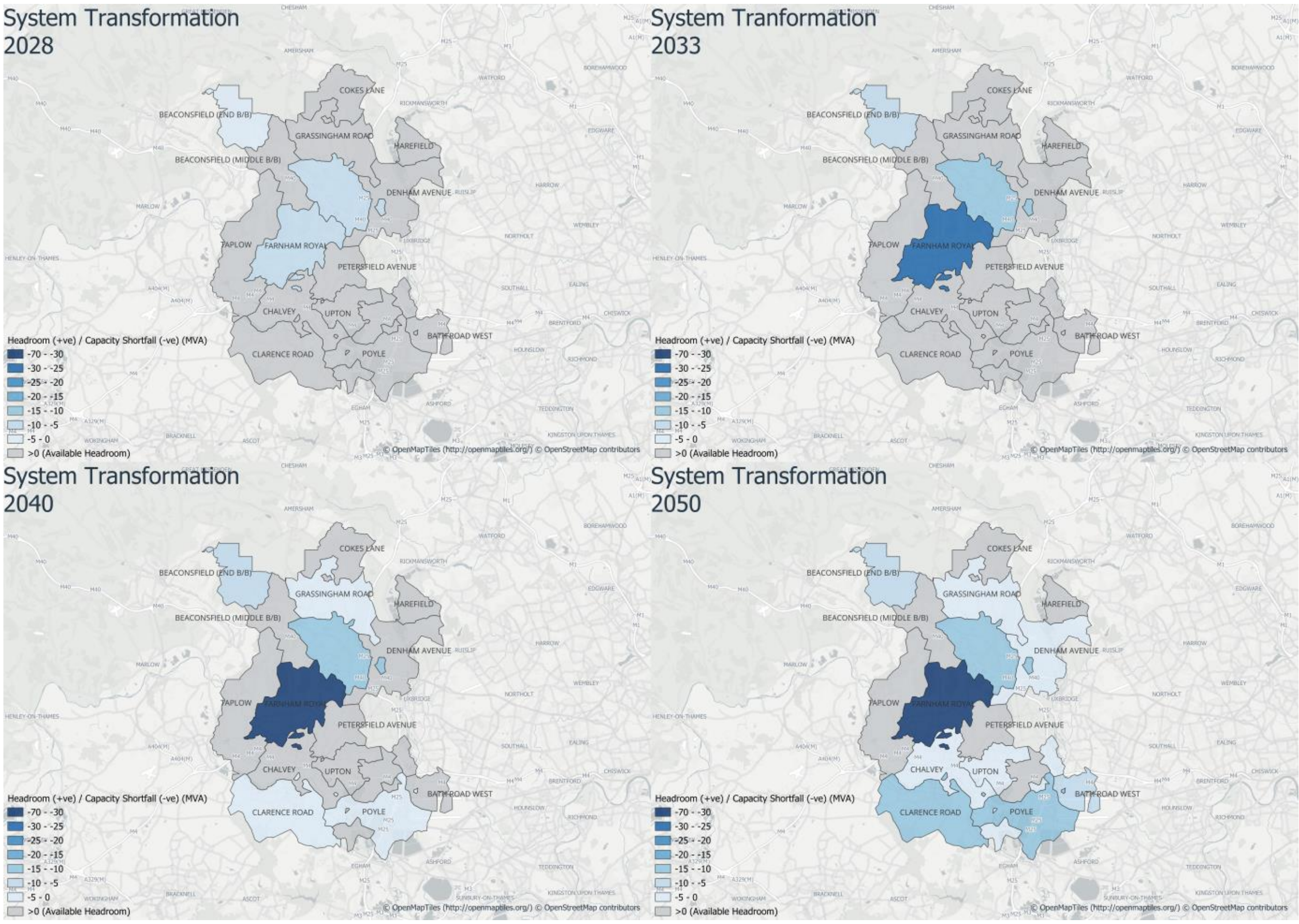


Figure 30 Iver 132kV GSP – EHV/HV Spatial Plan - System Transformation

Appendix F HV/LV spatial plans for other DFES scenarios

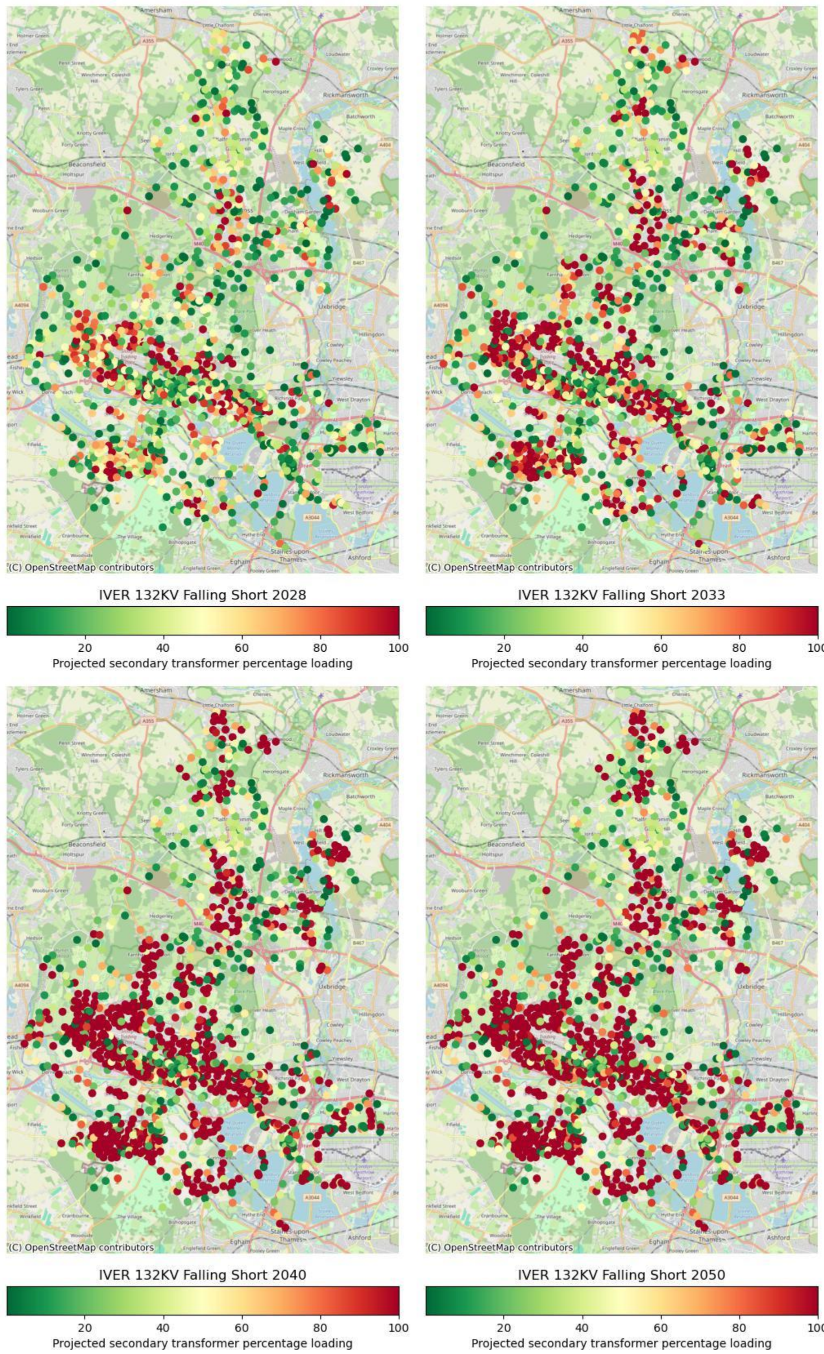


Figure 31 Iver 132kV GSP – HV/LV Spatial Plan – Falling Short

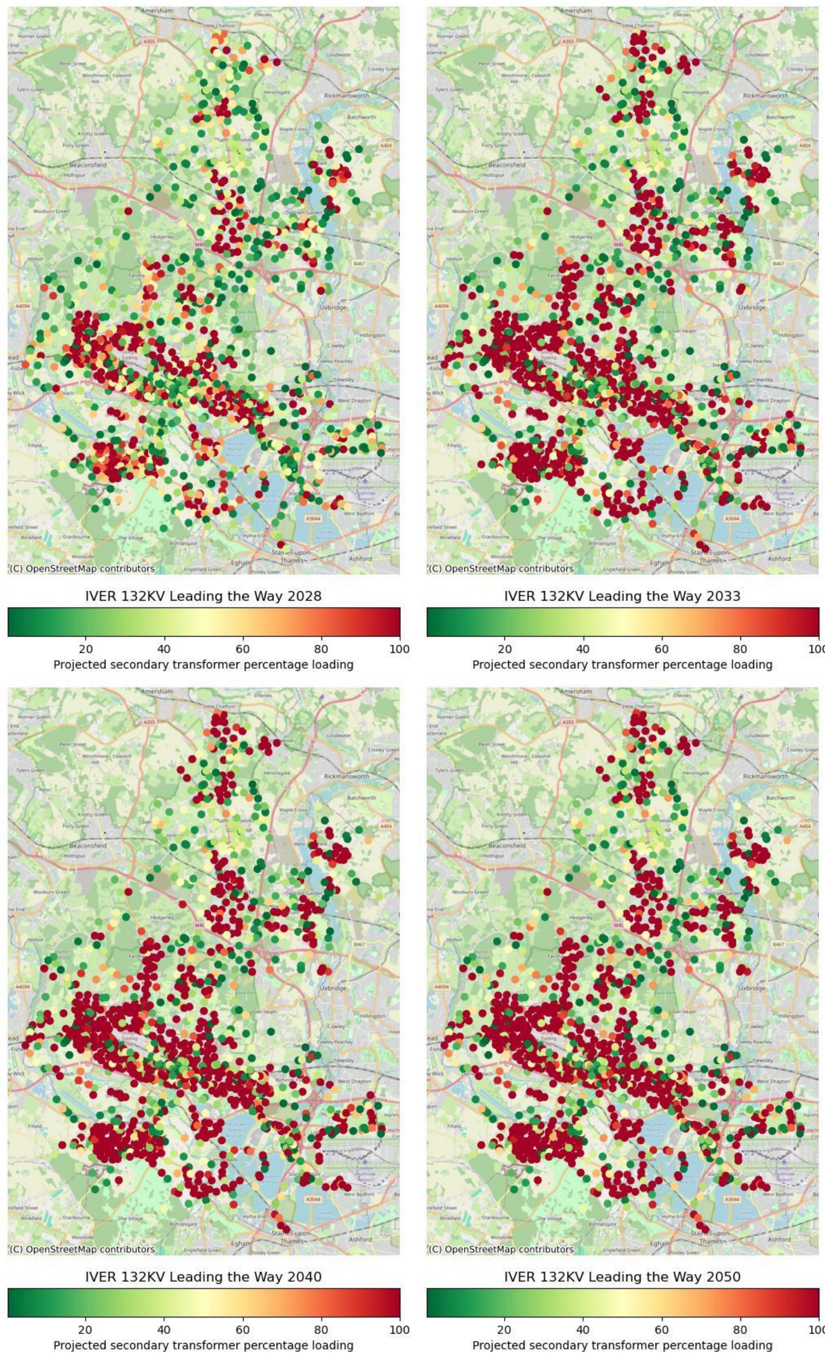


Figure 32 Iver 132kV GSP – HV/LV Spatial Plan – Leading the Way

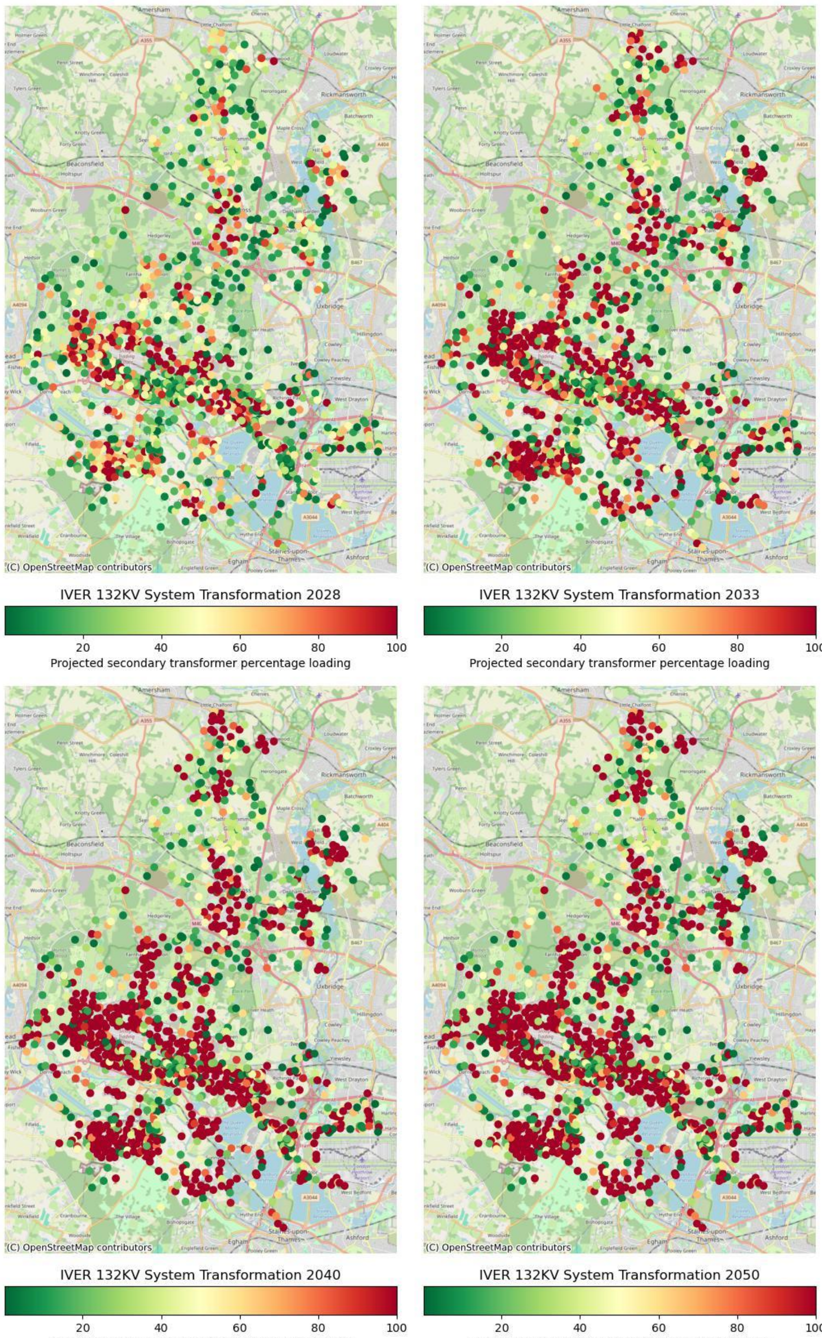


Figure 33 Iver 132kV GSP – HV/LV Spatial Plan - System Transformation

Appendix G Relevant DNOA Outcome Reports

DNOA Outcome Report

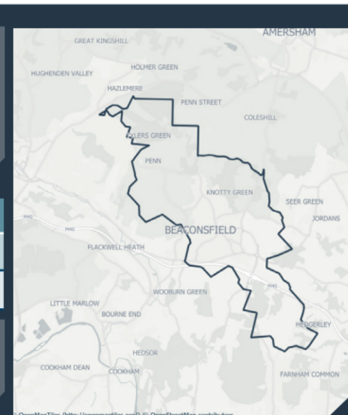
Beaconsfield

Scheme description

- Proposed reinforcements will increase capacity in Beaconsfield, Buckinghamshire. Postcode(s): BH20, HP7, HP9, HP10, HP13, HP15, RG31, SL0, SL2, SL6, SL9.
- Load related – substation thermal overload due to forecasted demand growth.

Proposed option

- Procure flexibility solutions for 2 years followed by asset solutions: installation of upgraded transformers and circuits.
- The option provides the economic benefit of reinforcement deferral, ensures P2 compliance until 2031, and sets up future works.
- Releases 22.9MVA of capacity at Beaconsfield.



Sysem need requirement

J	F	M	A	M	J	J	A	S	O	N	D
		■	■					■	■	■	

DNOA History

2023/24	2024/25	2025/26	2026/27	2027/28
Initial assessment				

Indicative flexibility price (if available):

- Availability £150/MWh
- Utilisation £200/MWh

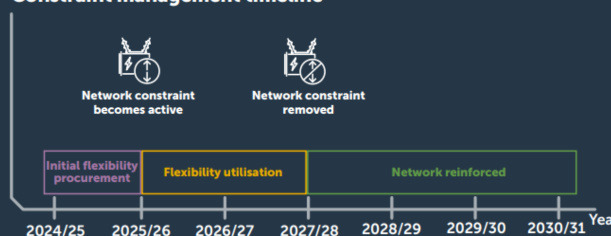
Reinforcement timeline

- Flexibility utilisation 2025/26 and 2026/27.
- Reinforcement delivery 2027/28.

Estimated peak MW outside firm network capacity under each scenario
Grey text relates to estimated peak MW without reinforcement delivery

	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
CT	-	0.3	0.9	- (2.6)	- (3.4)	- (4.3)	- (5.7)
ST	-	-	-	- (0.5)	- (0.9)	- (1.4)	- (1.8)
LTW	0.2	0.9	1.8	- (4)	- (5.2)	- (6.7)	- (8)
FS	-	-	-	- (0.2)	- (0.6)	- (1)	- (1.4)

Constraint management timeline



Scottish and Southern Electricity Networks Distribution | **DNOA Outcomes Report March 2024**

DNOA Outcome Report

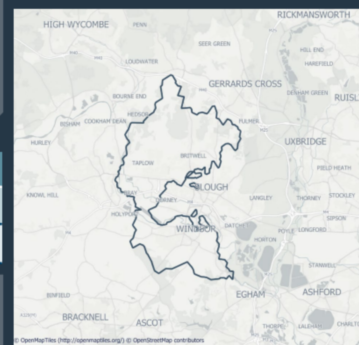
Slough and Windsor (Slough, Slough South, & Cippenham BSPs) Ref. 0724-33

Scheme description

- The following reinforcements will increase capacity in Slough, Windsor, and south Buckinghamshire. Postcode(s): GU24, HP9, SL(0-6), SL9.
- Load related – thermal overload at Slough, Slough South, and Cippenham BSPs during SCO conditions due to forecasted demand growth.

Proposed option

- Asset solutions: installation of additional transformer, 132kV cable, and busbars.
- Creates sufficient capacity for Slough, Slough South, and Cippenham to meet demand forecasted to 2050 and ensures P2/8 compliance. Use of flexibility was determined not to be viable due its availability falling short of the required amount.
- Released capacity: 92MVA



System need requirement

J	F	M	A	M	J	J	A	S	O	N	D

DNOA History

2024/25	2025/26	2026/27	2027/28	2028/29
Initial assessment				

Indicative flexibility price (if available):

- Availability: N/A
- Utilisation: N/A

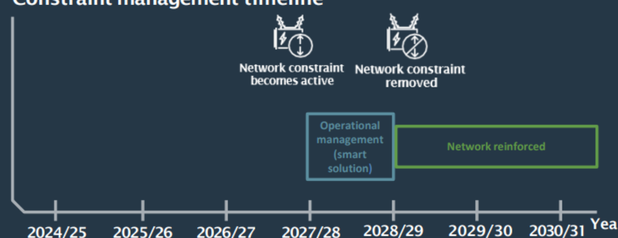
Reinforcement timeline

- Reinforcement delivery by 2028/29.

Estimated peak MW outside firm network capacity under each scenario
Grey text relates to estimated peak MW without reinforcement delivery

	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
CT	-	-	-	- (28.8)	- (33.4)	- (38.6)	- (43.4)
ST	-	-	-	- (25.3)	- (28.3)	- (31.9)	- (35.1)
LTW	-	-	-	- (31.5)	- (36.4)	- (42.4)	- (47.8)
FS	-	-	-	- (25.1)	- (27.9)	- (31.1)	- (34.2)

Constraint management timeline



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DNOA Outcome Report

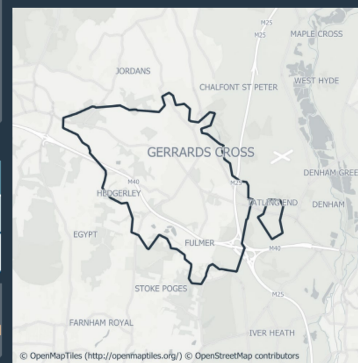
Gerrards Cross (Gerrards Cross PSS) Ref. 0724-27

Scheme description

- This reinforcement will increase capacity in the Gerrards Cross area, south Buckinghamshire. Postcodes: HP7, HP9, SL0, SL2, SL3, SL6, SL9, UB9.
- Load related – substation and circuit overload during FCO conditions due to forecasted demand growth.

Proposed option

- Asset solutions: installation of new transformers and circuits.
- Ensures that Gerrards Cross PSS is compliant in FCO conditions and accommodates future demand growth out to 2050. Flexibility was determined not to be suitable to defer reinforcement due to assets being near end of life.
- Releases 12.8MVA of capacity



System need requirement

J	F	M	A	M	J	J	A	S	O	N	D

DNOA History

2024/25	2025/26	2026/27	2027/28	2028/29
Initial assessment				

Indicative flexibility price (if available):

- Availability: N/A
- Utilisation: N/A

Reinforcement timeline

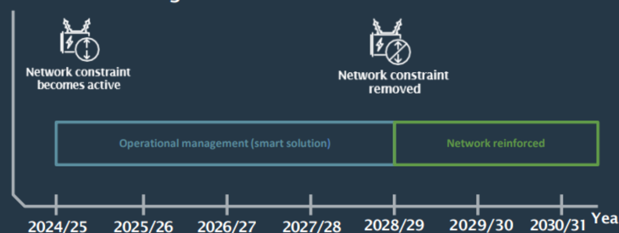
- Substation will be operationally managed to ensure compliance, until reinforcement delivery.
- Reinforcement delivery by 2028/29.

Estimated peak MW outside firm network capacity under each scenario

Grey text relates to estimated peak MW without reinforcement delivery

	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
CT	3.8	4	4.5	5	- (5.6)	- (6.2)	- (6.9)
ST	3.6	3.8	4	4.3	- (4.7)	- (5.1)	- (5.4)
LTW	4	4.4	4.8	5.4	- (6)	- (6.9)	- (7.7)
FS	3.6	3.7	3.9	4	- (4.2)	- (4.6)	- (4.8)

Constraint management timeline



Scottish and Southern Electricity Networks Distribution | **DNOA Outcomes Report July 2024**

DNOA Outcome Report

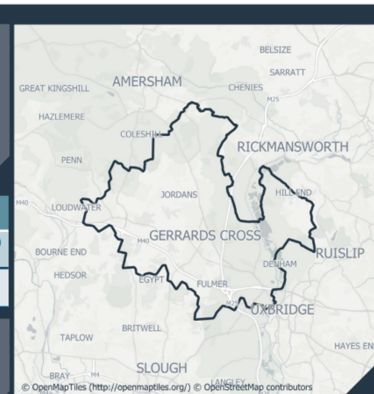
South Buckinghamshire (Denham BSP) Ref. 0724-35

Scheme description

- This reinforcement will increase capacity in the south Buckinghamshire area. Postcodes: HP(7-9), RG31, SL(0-3), SL6, SL9, UB8, UB9, WD3.
- Load related – substation and circuits overload during SCO conditions due to forecasted demand growth.

Proposed option

- Asset solutions: installation of new transformers and circuits.
- The upgrade ensures the compliance of Denham and West Hyde BSPs for SCO conditions and accommodates future demand growth at Denham BSP to 2050. Flexibility was determined not to be suitable to defer reinforcement due to assets being near end of life.
- Releases 90MVA of capacity.



System need requirement

J	F	M	A	M	J	J	A	S	O	N	D

DNOA History

2024/25	2025/26	2026/27	2027/28	2028/29
Initial assessment				

Indicative flexibility price (if available):

- Availability : N/A
- Utilisation : N/A

Reinforcement timeline

- Substation will be operationally managed to ensure compliance, until reinforcement delivery.
- Reinforcement delivery by 2028/29.

Estimated peak MW outside firm network capacity under each scenario

Grey text relates to estimated peak MW without reinforcement delivery

	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
CT	22.8	24.1	26	14.8	- (17)	- (19.1)	- (21.7)
ST	23.2	25.5	26.5	14.3	- (15.2)	- (16.1)	- (17.1)
LTW	26.2	30	32.3	21.8	- (24.2)	- (27.4)	- (30.7)
FS	21.3	21.8	22.4	10	- (10.6)	- (11.2)	- (11.9)

Constraint management timeline

Appendix H Glossary

Acronym	Definition
AIS	Air Insulated Switchgear
ANM	Active Network Management
BAU	Business as Usual
BSP	Bulk Supply Point
CB	Circuit Breaker
CBA	Cost Benefit Analysis
CER	Consumer Energy Resources
CMZ	Constraint Managed Zone
CT	Consumer Transformation
DER	Distributed Energy Resources
DESNZ	Department for Energy Security and Net Zero
DFES	Distribution Future Energy Scenarios
DNO	Distribution Network Operator
DNOA	Distribution Network Options Assessment
DSO	Distribution System Operation
DSR	Demand Side Response
EHV	Extra High Voltage
EJP	Engineering Justification Paper
ER P2	Engineering Recommendation P2
NESO	National Energy System Operator
NGET	National Grid Electricity Transmission
ENA	Electricity Networks Association
EV	Electric Vehicle
FES	Future Energy Scenarios
FS	Falling Short

GIS	Gas Insulated Switchgear
GSPs	Grid Supply Point
HV	High Voltage
kV	Kilovolt
LAEP	Local Area Energy Planning
LCT	Low Carbon Technology
LENZA	Local Energy Net Zero Accelerator
LV	Low Voltage
LW	Leading the Way
OHL	Overhead Line
PSS	Primary Substation
PV	Photovoltaic
NSHR	Network Scenario Headroom Report (part of the Network Development Plan)
MW	Megawatt
MVA	Mega Volt Ampere
ODM	Operational Decision Making
RESOP	Regional Energy System Operation Planning
RIIO-ED1/2	Revenue = Incentives + Innovation + Outputs, Electricity Distribution 1 / 2 (regulatory price control periods)
SDP	Strategic Development Plan
SEPD	Southern Electric Power Distribution
SLC	Standard Licence Condition
SSEN	Scottish and Southern Electricity Network
ST	System Transformation
UM	Uncertainty mechanism
VFES	Vulnerability Future Energy Scenarios
WSC	Worst Served Customers

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